Employee Performance Appraisal System Using Hybrid algorithm

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***Abstract*—Employee performance appraisal system it is effective technique that contributes to the important aspects of the organization in its business domain. The traditional methods of evaluation are rating scale method and qualitative appraisal criteria using quantifiable attributes however it's in capable of providing accurate result. This can lead to biasness with evaluation and the employees may get dissatisfied outcomes in which they feel not justifiable enough. Therefore, an advanced system for employee evaluation system is proposed which evaluates performance of the employee and provide accurate result using the hybrid algorithm (Naïve Bayes, ID3 and Linear Regression). The aim of this paper is to compare accuracy of ID3 and hybrid algorithm for given dataset.**

Keywords—Employee Performance Appraisal System, Machine Learning, Hybrid Algorithm

I. INTRODUCTION

Performance Evaluation / Approval (PA), is a process for individual employee and line managers, to discuss the employees' performance and development, in addition to the support they need in their work. It is also used to assess recent performance and focus on future objectives, opportunities and resources needed [1]. PA has become the root for a variety of activities, through which organizations seek to assess employees and develop their competence, enhance performance and distribute rewards. It sometimes becomes a part of a broader approach integrating human resource management strategies, also known as performance management [2]. The rating scale is formally used in performance appraisal as a manager rates performance on a predefined range as: excellent, good, average, fair, and poor. The range is mapped numerically, from 1 (poor) to 5 (excellent) [3]. This introduces practical challenges to the review process e.g. unfair predefined ratings.

II. TRADITIONAL SYSTEM

A. 360-Degree Performance Appraisal

The 360-degree performance method is a comprehensive review of task ability, professionalism and leadership traits. It not only considers the performance of tasks and the successful completion of goals but also interviews everyone who works with or under the employee along with any applicable manager reviews. The benefit of the 360-degree method is the level of detailed information it provides when it uses data from so many sources. It gives you an idea of the leadership potential and style of an employee, the person's impact on overall team morale, and whether the employee is a professional who gets the job done. The disadvantage of 360-degree method is that it consumes more time and energy .Based on complexity of the organisation , this performance appraisal method could take the time of many people to conduct a 360-degree review for all employees. Due to the time consumed , the usage of this methodology is often limited to reviews potential promotion and leadership candidates.

B. Self-Evaluation Method

The self-evaluation method allows employees to rate themselves on skills and goal achievement. It is often used in combination with other evaluation methods to get a stronger idea of any gaps that exist. The benefit of the self-evaluation method is that it allows you to get into the thought process of the employee Managers don't always see a low-performing employee as a highly

aspiring employee. The self-evaluation allow employees to define their own goals in professional development, achievement and promotion. Managers can identify motivated individuals with this method. .There is usually more engagement regarding solutions, action plans and next-step goals, because the employee is creating the appraisal, The self-evaluation method isn't without problems. Employees may not have a solid sense of self-awareness to provide quality information, which is why this method i`s usually not an exclusive appraisal. Some employers also find some employees are baised in the evaluation,which creates concerns about the accuracy of the evaluation.

C. Rating Scale Method

In business performance evaluationscommonly uses rating scales method. You have probably seen and even used this form of evaluation many times in your career. It consider all employees and rates them on a scale often ranges from one to five or one to 10. For example, an employee might score a nine on customer service but receive a five on compliant paperwork.

The benefit of this system is it creates an general measuring tool for large groups of employees. since all employee is graded on the same topics and the same scale. This makes it fast and easy method of evaluation, making it cost-effective to administer.

A significant issue with this method occurs when managers go through them so quickly they don't truly consider the employee's performance. Some reviews may be more arbitrary than others, while some may be skewed by a bias if the manager favours one employee over another.

III. OVERVIEW

By observing the current system, we have analyse that the system is prone to Bias, Leniency, Central and Severity Tendencies, Compare/Contrast Error, Attribution Error, The Regency Effect, Similarity Error, The Halo (or Horns) Effect, Stereotyping.

By taking into consideration these problems, we came up with the idea of evaluating the employee performance appraisal system using hybrid algorithm. This would save lot of time and provide accurate result.

IV. PROPOSED SYSTEM

The identified main problem of the current employee appraisal is the reviewer's rating system. The process takes extra time since these ratings are predefined and very rigid. This research suggests an easy way for both the employees and the management without any bias. The anticipated solution is given using advance system that uses algorithmic approach.

The Paper proposes to design a system that uses hybrid algorithm evaluate the employee performance and provides more accurate results.

The system will compare the accuracy given by ID3 and the hybrid algorithm and classify the employee into four categories A, B, C and D.

Evaluation time duration is the time duration which the company decides to evaluate employees . This time can be decided by the organisation, for the evaluate engine to run in a periodical manner e.g. Two week sprint. Then each criterion will extract data from relevant data source, runs the algorithm and generate an evaluation score

V. PHASES OF SYSTEM

Fig. 1. shows the overall System flow is given.
Following are the different scenarios of the system:

A. Classification

The user who wants use the system, will download android application of our system. After installing the application, the employee will login into the system and view dashboard and his own pie chart. The employee can see the own rank which in turns contribute to the competitiveness amongs the employess for the appraisal .

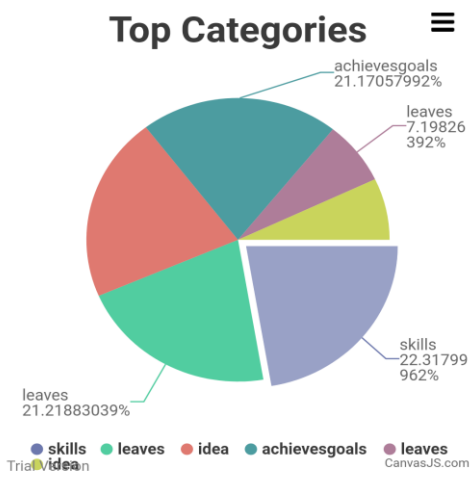
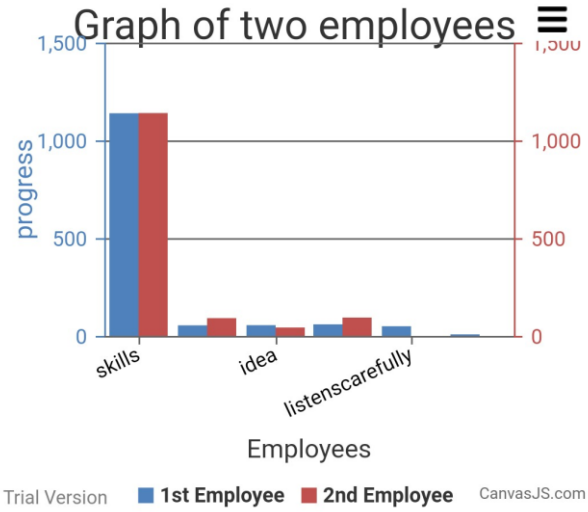


Fig. 1 :Different categories

The HR will login into the system and will upload the dataset periodically on which the algorithm will be apply and the result will be produce in the form of pie chart and graph/ we can also apply filters and compare two employees, see the rank of each employee.

Fig 2.Graph of employes

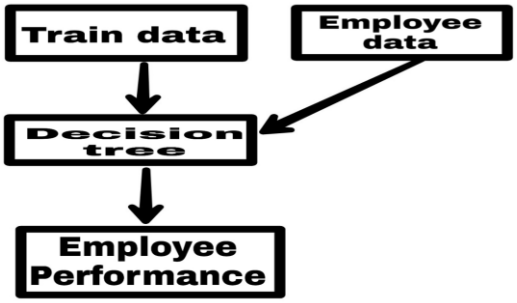


B. *Algorithms*

Decision Tree algorithm

In our proposed system all the task are performed by an admin. Task means adding training data set which required for calculating an entropy and information gain. Once this two module are calculated the decision tree is created by using an ID3 algorithm. After this employee data is added to the database by considering the attributes like quality, behavior, skills, projects etc. Here we assigning a number between 1 to 10 to each attribute of an employee for calculating a performance of an employee by using a decision tree by considering the information provided by admin the probability of an employee performance is generated.

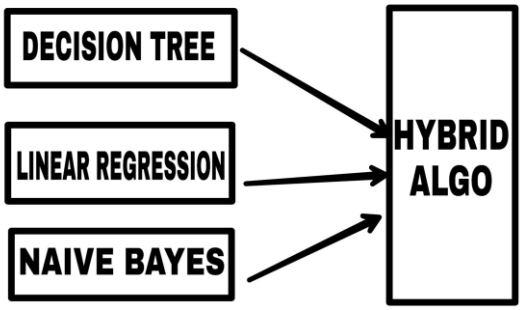
Fig 3. Employee Performance Simulation



Hybrid algorithm

In hybrid algorithm we have used Naive Bayes, Decision Tree and Linear Regression in parallel manner .Suppose naive Bayes puts one employee in category A and ID3 algorithm also puts that employee in category A and the Linear regression puts that employee in category B then we will take mode of all perdictions and display the result.

Fig 4.Hybrid algorithm block daigram.



Since two algorithm that is Naive Bayes and ID3 algorithm have put the employee in category A .Finally the employee will be in category A .We run 3 different algorithm on the data set the algorithm with highest accuracy for that algorithm result will be shown. For example if we get 81.72% accuracy with Naive Bayes ,92.50% with ID3 algorith and 89.65% with Linear Regression then algorithm with highest accuracy will be taken into consideration.

Table 1.Accuracy of the different algorithm on given Dataset.

Algorithm	Accuracy
Decision Tree	83.56%
Naive Bayes	78.56%
Linear Regression	48.52%
Hybrid	91.64%

C. Dataset

The required attributes has been provided by the company itself which we generated the values which are validate by the company.

Table 2. Characteristics of Dataset.

Attributes name	Characteristics
emp_id	Uniquely identifies employees
skills	Different skill set of employees
leaves	Number of leaves taken
Idea	Providing inovation solution
achievesgoals	Number of times met the target
listenscarefully	Observation and understanding of towards a problem
identifiesproblem	Problem solving technique
class	Classifying employees into different categories(A,B,C,D)

VI. CONCLUSION AND FUTURE SCOPE

In this paper idea of easily evaluating employees with proper accuracy is introduced by applying ID3 and hybrid algorithm for a given dataset. ID3 give the accuracy 83% whereas hybrid algorithm gives 90% along with that we have implemented various features which automates the appraisal process and give the accurate result. The employee can provide suggestion from the system which will be acknowledge to the employee it helps to provide transparency to the employee more over it is better than the rating scale method as its reduces the calculation and reduces the time and efforts the employee appraisal system using hybrid approach evaluates the performance of the employee and classify the employee into different category more accurately This feature would make the system more user friendly and informative.

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