EMPLOYEE PROMOTION CRITERIA ANALYSIS USING ADAPTIVE LINEAR NEURON METHODOLOGY

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ABSTRACT:

Employee Promotion Criteria analysis using Adaptive Linear Neuron Methodology Promoting employees to next category is to be done carefully, otherwise, it can lead to repercussions in the organization. For instance, if an employee who is not good, is promoted to the next level, he may not be able to perform well in the next level. Also, good employees, who are not promoted may leave the organization with dissatisfaction. This project aims at developing a tool for identifying the employees to be promoted, using measurable criteria like hardwork index, Delivery Index. Hard work index is calculated by using positive factors like: Additional hours spent during last year, Additional week end days (either sat/sun), Additional total week ends, Compensatory Leaves not Utilized. Negative factor like LOPs are also considered during the calculation. The delivery index is calculated by considering the positive factors: Number of on-time deliveries, Role played during delivery (Crucial/Important/Medium/Low), and Number of delayed deliveries as a negative factor. PyQt tool is used to create the Graphical User interfaces. All the Front end code is generated automatically by PyUIC.

IndexTerms – **Adaline Regression, Multivariate Regression, Supervised Learning.**

INTRODUCTION:

Promoting employees to next category is to be done carefully, otherwise, it can lead to repercussions in the organization. For instance, if an employee who is not good, is promoted to the next level, he may not be able to perform well in the next level. Also, good employees, who are not promoted may leave the organization with dissatisfaction. This project aims at developing a tool for identifying the employees to be promoted, using measurable criteria like Hard-work Index, Delivery Index. Hard work index is calculated by using positive factors like: Addnl.hours spent during last year, Addnl.week end days (either sat/sun), Addnl.total week ends, Compensatory Leaves not Utilized. Negative factor like LOPs are also considered during the calculation. The delivery index is calculated by considering the positive factors: Number of on-time deliveries, Role played during delivery (Crucial/Important/Medium/Low), and Number of delayed deliveries as a negative factor.

The project comprises of four modules. The first module deals with the creation of GUIs for storing the company, employee details in the DB. This module also deals with the creation of the needed DB entities. The second module deals with the development of the python routines needed for the calculation of Hard work Index, Delivery Index .Also, the main entry screen, that is needed to call the other screens and routines, is developed in the second module. The third module deals with Adaline regression and plotting the Stochastic Gradient Descent Graph, and the fourth module deals with Multivariate Regression. Multivariate regression is used to re-verify the result obtained from Adaline Regression.

ADALINE stands for Adaptive Linear Neuron. It is an artificial neural network. It was developed by Professor Bernard Window at Stanford University. It consists of a weight, a bias and a summation function. The weights are adjusted according to the weighted sum of the inputs (the net).Pyplot is used to plot the Adaline Stochastic Gradient Descent Graph. Using the Gradient Decent optimization, the weights are updated incrementally after each epoch. An epoch is one pass over the training dataset. The dataset is obtained from TTEC, Colorado. It comprises of HardworkIndex, DeliveryIndex and Decision for promotion.

LITERATURE SURVEY:

Gradient Descent (GD) Optimization. Using the Gradient Decent Optimization algorithm, the weights are updated incrementally after each epoch(=pass over the training dataset). Compatible cost functions J (.) Sum of squared errors(SSE) [mlxtend.regressor. Linear Regression(../../regressor/linearregression/),mlxtend.classifier.Adaline(../../classifier/Adaline/)]   Logistic   cost(cross-entropy) [mlxtend.classifier.Logistic regression(../../classifier/logistic regression/)] In Gradient Descent Optimization, we compute the cost gradient based on the complete training set; hence we sometimes also call it batch Gradient Descent. In case of very large datasets, using gradient descent can be quite costly since we are taking a single step for one pass over the training set –thus, the larger the training set, the slower our algorithm updates the weights and the longer it may take until it converges to the global cost minimum (note that SSE cost function is convex).In Stochastic Gradient Descent (sometimes also referred to as iterative or linear or on-line gradient descent).

Here, the term "Stochastic" comes from the fact that the Gradient based on a single training sample is a "stochastic approximation" of the "true" cost Gradient .Due to its Stochastic nature, the path towards the global cost minimum is not "direct" as in Gradient Descent. But may go "zig-zag" if we are visualizing the cost surface in a 2D space. However, it has been shown that Stochastic Gradient Descent surely converges to the global cost minimum if the cost function is Convex(or pseudo-convex).

PROPOSED SYSTEM

In this proposed system, we focus on developing a tool for Employee Promotion Criteria analysis using Adaptive Linear Neuron Methodology. The project is very useful to the Human Resources Department, in accurately determining the employees to be promoted. The project is also useful to the hard working employees, as their efforts are properly recognized by the tool, while determining the promotions. This project finally leads to the quality of the working environment in organizations. Using latest neural net technology in the promotions process, and comparing the result with multi variate regression. Using Python, which is chosen as the best programming language, by the Programming Community. More Functionality can be implemented with less no of lines of code in Python. This tool is developed by using Python along with its layout toolkit PyQt & PyUIC.

SYSTEM ARCHITECTURE

Details like Company details and employee details are to be provided as Input to the system, using the corresponding user interfaces.

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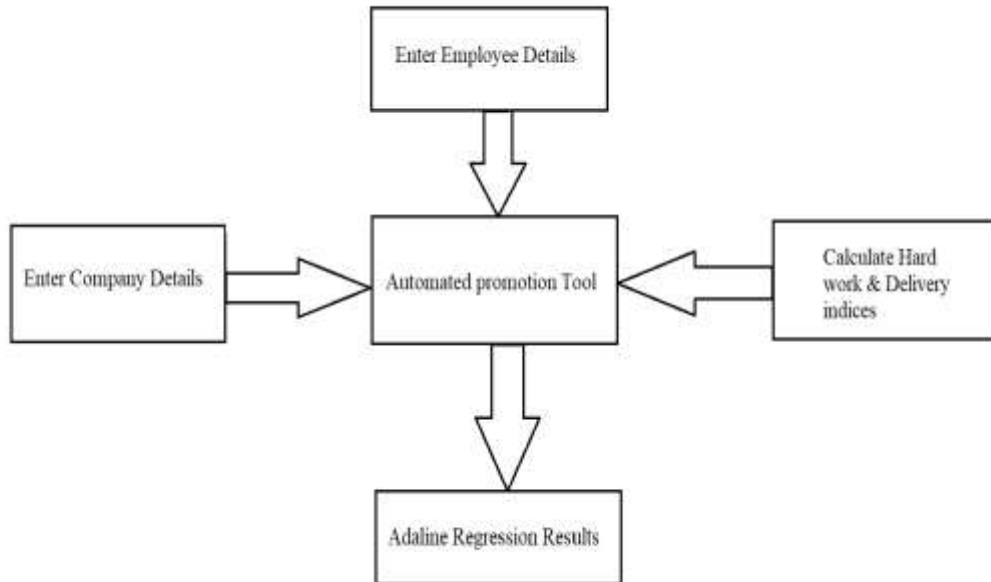
ALGORITHM:

<u>**Adaline Neural Net:**</u>

ADALINE stands for Adaptive Linear Neuron. It is an artificial neural network. It was developed by Professor Bernard Widrow at Stanford University. It consists of a weight, a bias and a summation function. The weights are adjusted according to the weighted sum of the inputs (the net).

Steps Involved:

1. Initialize the weights with random values and calculate Error.

2. Calculate the gradient i.e. change error when the weights are changed by a very small value from their original randomly initialized value. This helps us move the values of weights in the direction in which error is minimized.

3. Adjust the weights with the gradients to reach the optimal values where error is minimized.

4. Use the new weights for prediction and to calculate the new error.

5. Repeat steps 2 and 3 till further adjustments to weights doesn't significantly reduce the Error.

Multivariate Regression:

The multiple Variate regression equation is as follows:

$$\hat{Y} = b_0 + b_1 X_1 + b_2 X_2 + \ldots + b_p X_p$$

$$\hat{Y}$$

Where is the predicted or expected value of the dependent variable, X_1 through X_p are p distinct independent or predictor variables, b_0 is the value of Y when all of the independent variables (X_1 through X_p) are equal to zero, and b_1 through b_p are the estimated regression coefficients. Each regression coefficient represents the change in Y relative to a one unit change in the respective independent variable. In the multiple regression situation, b_1, for example, is the change in Y relative to a one unit change in X_1, holding all other independent variables constant (i.e., when the remaining independent variables are held at the same value or are fixed). Again, statistical tests can be performed to assess whether each regression coefficient is significantly different from zero.

MODULES

I. GUI CREATION:

The first module deals with the creation of GUIs for storing the company, employee details in the DB. A major advantage in GUIs is that they make computer operation more intuitive, and thus easier to learn and use. GUIs generally provide users with immediate, visual feedback about the effect of each action. GUI allows multiple programs or instances to be displayed simultaneously. This module also deals with the creation of the needed DB entities.

II. CALCULATE HARDWORK & DELIVERY INDICES:

The second module deals with the development of the python routines needed for the calculation of Hardwork Index, Delivery Index. Python provides excessive support libraries (numpy for numerical calculations. pandas for data analytics etc). It is a user friendly data structures. Also, the main entry screen, that is needed to call the other screens and routines, is developed in the second module

III. AUTOMATED PROMOTION:

The third module deals with Adaline regression and plotting the Stochastic Gradient Descent Graph. Adaline classifier is closely related to the Ordinary Least Squares (OLS) Linear Regression algorithm; in OLS regression we find the line that minimizes the sum of squared errors(SSE) or mean squared error(MSE) between our target variable and our predicted output over all samples in our dataset

IV. ADALINE AND REGRESSION RESULTS:

The fourth module deals with Multivariate Regression. Multivariate Regression is a method used to measure the degree at which more than one independent variable (predictors) and more than one dependent variable(responses),are linearly related. Multivariate regression is used to re verify the result obtained from Adaline Regression.

CONCLUSION

This project entitled **"Employee Promotion Criteria analysis using Adaptive Linear Neuron Methodology."** is useful to identify the employees suitable for promotion. The project is very useful to the Human Resources Department, in accurately determining the employees to be promoted. The project is also useful to the hard working employees, as their efforts are properly recognized by the tool, while determining the promotions. This project finally leads to the quality of the working environment in organizations. Many problems are already solved using neural networks, some of the long-term implications of ADALINE neural networks could be image processing, applications in business science and industry.

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