Employees Skills Inventory using Deep Learning for Human Resource Management

PATEL PARTHKUMAR GULABBHAI[1], MANISH GANGIL[2]

[1]M.Tech Student, [2]Professor
[1,2] Department of Mechanical Engineering
Sri Satya Sai College of Engineering, RKDF University, Bhopal.

[2]gangilmanish@gmail.com

Abstract

Inventory is an accounting term that refers to products that are in different stages of being made ready for sale, including: finished as well as unfinished products and raw materials. One amongst the area for inventory management is worker behavior in a company. So, employees are taken into account to be as an inventory that contributes in growth of an organization. With increasing competition in the market, employees' attrition increases. Moreover, the decision makers always are in the face of improper management. Whenever an employee leaves an organization, there is a source of advantage for the business competitor because of the invaluable tacit knowledge that the employees carries with them. Therefore, to be continuously competitive in the business, the organization should minimize the employees' attrition. Employees' attrition may be a big issue for the organizations specially once trained, technical and key staff leave for a far better chance from the organization. This results in financial loss to replace a trained employee. Therefore, this research work uses the current and past employees' data to analyze attrition behavior of employees and to provide bonus/promotion to employees having non attrition behavior by using LSTM and fuzzy rules. The result shows that the accuracy of model is enhancement with respect to existing methods by approximately 4%. This model decides to give forecasting for shortage of trained employees with respect to department and can give an alert message for hiring new employees or to distribute work load among existing employees. This model also gives decision for bonus and promotion without any partiality and indirectly helps in development of the organization.

Keywords: Raw materials, Inventories, Inventory Management, Artificial Intelligence, Fuzzy rules.

---

1 INTRODUCTION

Inventory management refers to the process of ordering, storing and using a company's inventory. These include the management of raw materials, components and finished products, as well as the storage and processing of these items. For companies with complex supply chains and production processes, it is particularly difficult to balance the risk of stocks and bottlenecks [1]. To achieve this balance, companies have developed two main methods of inventory management: Just-In-Time (JIT) planning. The goal of inventory management is to meet customer needs by storing the right amount at the right time so that the resulting costs are minimal. This is an essential element in most companies and usually cannot be separated from other functions. For example, an optimal filing policy will surely depend on the promotions made by the marketing department [2].

Since a company's staff is the most valuable resource, managers need all the tools to properly implement the skills and abilities of their employees [3]. A tool that managers can use is an inventory of skills. The use of an inventory of skills can be very useful for achieving company goals and making better decisions in terms of personnel management and management. A workforce, also called Skills, summarizes the qualifications, training and experience of current employees. Depending on the size and complexity of a company, the process of creating an inventory of skills varies. Some companies use commercial software. Other companies use database programs. Some small companies use simple spreadsheets or even a paper-based system to create the skills inventory [4].

Regardless of the methodology used, an inventory of skills, once completed correctly, will provide a collective inventory of the skills, knowledge and practical experience of a company's staff [5]. Managers can then use this information on the skills inventory to improve decision making in multiple areas, including:

i.   Hiring staff that better meet the current and future needs of the various business units.
ii.   Assigning the right employees to the right functions.
iii. Staffing internal project teams with the best talent to ensure organizational success.

iv. Targeting training and development efforts to alleviate existing skill gaps.
v. Identifying key employees to develop for future business needs.
vi. Developing an internal talent channel to replace key employees and managers that depart from the organization.
vii. Developing a workforce plan for the future strategic needs of the business.

An updated inventory of skills will benefit human resources by analyzing and effectively comparing information on multiple employees within the organization. This can then be used to decide on items such as promotions, training, updates and future recruitment needs of the organization [6].

However, it is extremely important that the human resources inventory is regularly updated to ensure its relevance and usefulness. Collecting accurate information on each employee of the company is often a tedious and time-consuming activity that is very difficult on paper. The human resources inventory is also called a "snapshot" of a company, the static inventory has no value [7]. Few of the currently used tools for employees' attrition prediction are as follows:

IBM HR Analytics

IBM Software offers one of its products in the Talent Management Software (TMS) category, called IBM Kenexa HR Analytics, provided by IBM Watson Analytics. One of the solutions offered by IBM Workforce Analytics is employee attrition prediction [8]. It analyzes the main wear factors, therefore it foresees the wear of the employees.

SAP Workforce Analytics

SAP SuccessFactors use predictive analytics to answer questions about understanding revenue, and to identify and manage the risk of theft. For example, IBM and SAP have developed a solution and developed their own application to predict employee friction so that the company can find a replacement for an employee in advance.
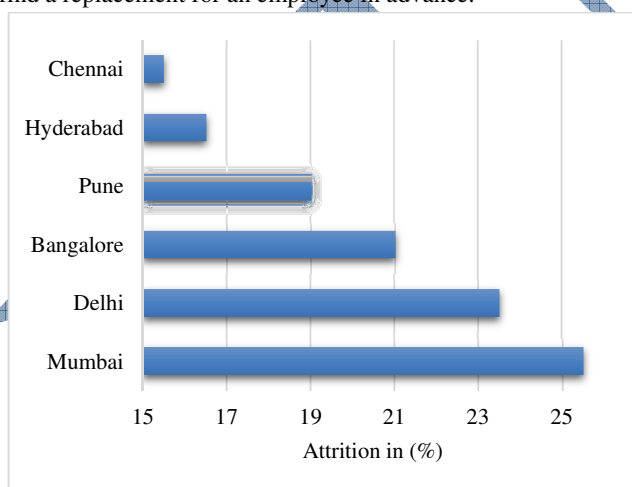

Figure 1: Employee Attrition Trends by Cities

Attrition Trends in India

i. Mumbai currently has the highest annual attrition rates in analytics, at 25.7%. The city boasts of a robust data science ecosystem, mostly from banking and finance industry. Coupled with high salaries and demand for data scientists, Mumbai is pushed to the highest position in terms of employee attrition [9].
ii. Chennai, on the other hand, has the lowest attrition rates, at just 15.5%.
iii. It is evident that larger cities, with bigger employee base in analytics (Bangalore, Mumbai & Delhi/ NCR) have higher attrition rates, higher than 20%. While, cities with lesser employee base have in turn lower attrition rates, lesser than 20%.
iv. Also, current analytics employees in Mumbai are on average staying their current organizations for an average of 4.2 years. As earlier mentioned, we did not find any correlation with attrition rates and tenure.
v. Tenure of analytics professionals in Chennai is highest, at 4.5 years.

II. RELATED WORK

Alduayj et al. [1] studied employees' attrition using machine learning models. Using a synthetic data created by IBM Watson, three main experiments were conducted to predict employee attrition. The first experiment involved training the original class-

imbalanced dataset with the following machine learning models are: Support Vector Machine (SVM) with several kernel functions, Random Forest (RF) and K-Nearest Neighbor (K-NN) above mentioned machine learning models.

Soni et al. [2] investigated the employee characteristics and various organizational variables that may result in Employee Turnover. Product innovations and corresponding product variables can be duplicated, but the harmony of an organization's employees can never be replicated, hence they are of utmost importance. Two classification methods that were used for the comparison of the prediction accuracy and generalization capabilities are, Artificial Neural Network (ANN) and Adaptive Neuro-Fuzzy Inference System (ANFIS).

Sisodia et al [3] proposed a model which will predict employee churn rate based on HR analytics dataset obtained from Kaggle website. To show the relation between attributes, the correlation matrix and heatmap is generated. In the experimental part, the histogram is generated, which shows the contrast between left employees vs. salary, department, satisfaction level, etc. For prediction purpose, we use five different machine learning algorithms such as linear support vector machine, C 5.0 Decision Tree classifier, Random Forest, k-nearest neighbor and Naïve Bayes classifier. This paper proposes the reasons which optimize the employee attrition in any organization.

Ford W. Harris [4] developed the first mathematical model for inventory management, the Economic Order Quantity Model (EOQ), introduced in 1913. It was designed for production planning purposes. EOQ is a dynamic and deterministic mono-product model, essentially very simple. The model indicates the optimal solution for knowing the behavior of the inventory system. The closed solution is also easy to calculate.

Pikulkaew Tangtisanon [5] focused on an inventory management and a stock forecasting system. Web service was implemented as a new approach for an inventory management system that helps to manage and to find the food additives that exist in the international food additive database authorized by Codex Alimentarius Commission. The stock forecasting was done with four machine learning models which are Naive Bayes, Decision Tree, Linear Regression and Support Vector Regression to predict stock of food additive.

Ibrahim et al. [6] used data mining techniques such as clustering, classification and association rule. The accuracy and preciseness of the technique used is so essential to the success of any retention attempting. After all, if the company is not aware of a customer who is about to leave their business; no proper action can be taken by that company towards that customer.

Dolatabadi et al. [7] discussed on increasing competition among service companies to predict the tendency of customers to retain customers is so important. The consequences of brand loyalty and the loss of a customer base in a company and the difficulty of acquiring a new customer for each lost customer are very difficult for companies. It can be very useful to have a predictive model of customer behavior to plan and process this type of case.

Franciska et al. [8] discussed that clustering is a performed by grouping objects based on similarity of its characteristics to provide patterns and knowledge of given user data. Different types of clustering algorithms called partitioning, hierarchical and grid-based clustering methods. Here k-means clustering, k-medoids clustering, Hierarchical clustering, DBSCAN and Fuzzy c means clustering. Clustering algorithms are used for customer churn analysis; one of the important reasons is that the cost of increasing a new customer is much higher than retaining an existing customer by using customer churn analysis.

Xiaojuan et al. [9] aims to enhance the ability to forecast employee turnover with or without considering the impact of economic indicators. Various time series modelling techniques were used to identify optimal models for effective employee turnover prediction. More than 11-years of monthly turnover data were used to build and validate the proposed models. Compared with other models, a dynamic regression model with additive trend, seasonality, interventions, and a very important economic indicator effectively predicted the turnover with training R2 = 0.77 and holdout R2 = 0.59. The forecasting performance of optimal models confirms that time series modelling approach has the ability to predict employee turnover for the specific scenario observed in our analysis.

This research work is focused on finding a well trained and experienced employees, in any organization, for giving bonus or for replacement. Hiring new employees always costs organization some huge costs. Human Resource departments generate an enormous amount of data on a daily basis: leaves, social conflicts, annual evaluations, wages and benefits, recruitments, departures, career evaluations, etc. But the big dilemma is to find out the correct and accurate replacement of the employees who will left.

Here are some of the challenges faced by the hiring managers:

1. Employees' Attrition is a trivial issue for organization's loss such as financial loss, cost and time to get the replacement and hiring, retraining of new employee and also customer dissatisfaction.
2. Somehow organization can bear the loss of attrition of employees that are not as much experienced as those who has spent a significant amount of time that their attrition always results in some serious losses.
3. Employees' Attrition can have a negative impression on existing employees.
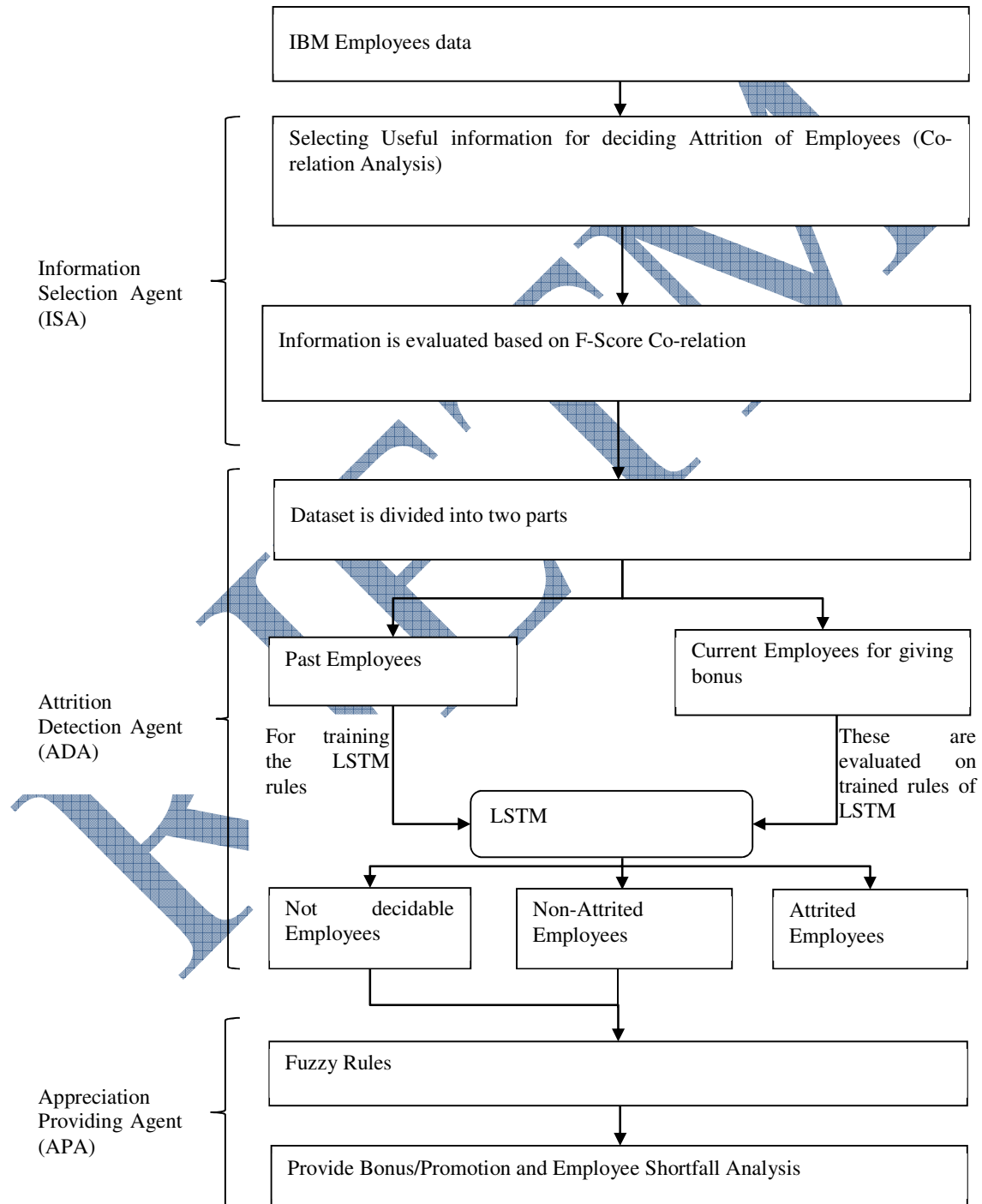4. Eligible Candidates Finding and sorting the best candidates.

Figure 2: Methodology for Employees Attrition Detection

5. Another area of research is to find out the candidates that would prove to be an asset to the firm if hired.
6. If a selected candidate drops off, then firm have to repeat the cycle of complete processes and find a replacement again.
7. HR department may do partiality in manual evaluation of employees for bonus.

III.METHODOLOGY

The proposed methodology works in different levels termed as multi-agent architecture which performed their function as discussed below:

1. The dataset is taken.
2. Handover dataset to Information Selection Agent (ISA).
3. Attrition Detection Agent (ADA) classifies new employees for their attrition behaviour using LSTM.
4. Non-attrition employees and not decidable employees are further considered for appreciation for which Appreciation Providing Agent (APA) are activated.

A. Information Selection Agent (ISA)

For finding relationship between features or employees' information, F-score co-relation are evaluated. It is a type of feature selection technique. Feature selection is an optimization technique for reducing dimensionality of data in various domains like machine learning, pattern recognition, and data mining. Its main purpose is to remove the redundant and irrelevant features. These features ultimately affect the performance of the classification algorithms in terms of time and cost and they offer little or no predictive information to the data mining systems. Removing unnecessary features is not quite easy task, as it is difficult to determine the relevance or irrelevance of a particular feature in the target class. The relevance of a particular feature between two features or among many features is measured by evaluation criterions.

F-Score is a technique which measures the discrimination when there are more than two classes of real numbers present in a dataset.

Let x_k, be the training vectors

where k=1, 2… m

l = total number of classes where (l>=2)

If the number of jth dataset is n_j, where j=1,2,…,l,

Then the F-Score of the ith feature is defined as:

$$F_i = \frac{\sum_{j=1}^{l}(\bar{x}_i^{(j)} - \bar{x}_i)^2}{\sum_{j=1}^{l}\frac{1}{n_j-1}\sum_{k=1}^{n_j}(x_{k,i}^{(j)} - \bar{x}_i^{(j)})^2} \tag{1}$$

Where $\bar{x}_i$ is the average of the ith feature of the whole dataset

$\bar{x}_i{}^j$ is the average of the ith feature of the jth dataset

$\overline{x_{k,i}}^j$ is the ith feature of the kth instance in the jth dataset

The numerator in the above equation (1) denotes the discrimination between each of the classes in the dataset, and denominator indicates the discrimination within each of the classes in the dataset. If the F-score values are larger between two features, then the two features are not relevant to each other. If the F-Score values are smaller, then they are likely to be relevant and yield better results.

After applying this algorithm, Information Selection Agent (ISA) will return that useful information that are beneficial for Attrition Detection Agent (ADA) for determining attrition among employees.

B. Attrition Detection Agent (ADA)

Employees' attrition is predicted by Attrition Detection Agent (ADA) by using a LSTM Classifier. One of the type of recurrent neural network (RNN) is Long short-term memory (LSTM). It is type of deep learning neural network approach composed of several neural network modules. The LSTM network is composed of four units: memory cell, input unit, output unit and forget unit. The memory unit is the unit that stores the data values for some time intervals and remaining three units regulates the flow of data values for evaluation of output value. The LSTM deep network is used for both

classification as well as regression process. At each time step t there is a set of vectors, including an input gate it, a forget gate f_t, an output gate o_t and a memory cell C_t.
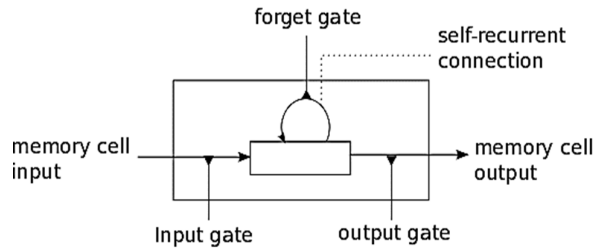

Figure 3: Long Short-Term Memory (LSTM) Units

All these together are used to compute the output of the hidden layer ht as follows:

$$f_t = \sigma(W_f * x_t + U_f * h_{t-1} + b_f) \tag{2}$$

$$i_t = \sigma(W_i * x_t + U_i * h_{t-1} + b_i) \tag{3}$$

$$\hat{C}_t = tanh(W_c * x_t + U_c * h_{t-1} + b_c) \tag{4}$$

$$C_t = i_t * \hat{C}_t + f_t * C_{t-1} \tag{5}$$

$$o_t = \sigma(W_o * x_t + U_o * h_{t-1} + b_o) \tag{6}$$

$$h_t = o_t * tanh(C_t) \tag{7}$$

In this model, σ is the sigmoid activation function, tanh the hyperbolic tangent activation function, x_t the input at time t, W_i, W_C, W_f, W_o, U_i, U_C, U_f, U_o are weight matrices to regulate the input and b_i, b_C, b_f, b_o are bias vectors.

C. Appreciation Providing Agent (APA)

After selecting Non-attrition employees and not decidable employees, bonus/promotion prediction is performed by designing fuzzy rules as in figure 4.4. as well as it also gives employee shortfall analysis as per department.

Four most important features (out of 23 features) are selected for designing fuzzy rules which are:

1. JobSatisfaction (1-5 rating)
2. NumCompaniesWorked (0-9 years)
3. PerformanceRating (1-5 rating)
4. TotalWorkingYears (0-40 years)

On these four features total 495 rules are designed (i.e. $^{12}C_4$) which select best employees for bonus distribution or promotion application.

IV. RESULTS AND DISCUSSIONS

In order to evaluate the performance of methodology, the proposed algorithm is simulated in following configuration:

1. Pentium Core I5-2430M CPU @ 2.40 GHz
2. 4GB RAM
3. 64-bit Operating System
4. MATLAB Platform

For simulation result, the research is focused towards co-relation feature extraction for attrition analysis from employees. For executing this simulation, IBM employee's dataset is prepared with 1470 employees.

Accuracy

The result analysis is performed to find accuracy of the proposed methodology and to decide the behaviour of the employees either it is of attrition or not, as in equation.

$$Accuracy = (TP+TN)/(TP +TN+FP+FN) \qquad (8)$$

Where,

TP = True Positive, that means if employee is of attrition behavior and the predicted label also stands for attrition behavior.

TN = True Negative, that means if employee is of non-attrition behavior and the predicted label also stands for non-attrition behavior.

FP = False Positive, that means if employee is of non-attrition behavior and the predicted label stands for attrition behavior.

FN = False Negative, that means if employee is of attrition behavior and the predicted label stands for non-attrition behavior.

Mean Absolute Percentage Error (MAPE)

The mean absolute percentage error (MAPE) is a measure of the predictive accuracy of a forecasting method in statistics, for example in estimating the trend. It usually expresses the precision in percentage and is defined by the formula:

$$MAPE = \frac{100}{n} \sum_{i=1}^{n} \frac{Target_{value} - Obtained_{value}}{Target_{value}} \qquad (5.2)$$

R^2

R-squared (R^2) is a statistical measure that represents the proportion of the variance for a dependent variable that's explained by an independent variable or variables in a regression model.

A. Attrition Prediction

In attrition prediction accuracy is evaluated first in order to analyze the performance of the algorithm whether it is correctly finding the attrition behavior or not. For this the research methodology is designed using LSTM for predicting either attrition or non-attrition behavior of the employees. These evaluations are performed on testing dataset. The training testing dataset is divided into 85:15 ratio, 80:20 ratio, 70:30 ratio and 60:40 ratio. The table I gives the performance of LSTM algorithm for employees' attrition prediction in terms of accuracy R^2 and MAPE.

Table I: Performance Evaluation for LSTM Algorithm

No. of Employees (out of 1470)	Accuracy (in %)	MAPE (in %)	R^2
220	97.27	8.6942	0.0239
294	94.85	7.8440	0.1168
441	93	10.90	0.0437
588	92.2	12.890	0.1626

B. Appreciation Providing

Then in next section it finds the employees which may be considered for appreciation in form of bonus or promotion. This methodology gives a innovative direction for employees' growth and development which ultimately get into direction for enhancement of growth rate of any organization and ultimately to growth of a country.

The table II gives a sample of selected employees out of 220 employees testing sample of employees for providing bonus/ Promotion. The sorted list of selected employees ID of IBM employees are given in the table.

Table II: Selected Employees for Bonus/Promotion

No. of Employees	Selected Employees Id for bonus

10	1251 1258 1262 1268 1275 1278 1282 1284 1288 1292
20	1251 1258 1262 1268 1275 1278 1282 1284 1288 1292 1295 1299 1307 1309 1310 1317 1318 1332 1338 1347
30	1251 1258 1262 1268 1275 1278 1282 1284 1288 1292 1295 1299 1307 1309 1310 1317 1318 1332 1338 1347 1348 1353 1355 1356 1359 1367 1378 1384 1387 1388
40	1251 1258 1262 1268 1275 1278 1282 1284 1288 1292 1295 1299 1307 1309 1310 1317 1318 1332 1338 1347 1348 1353 1355 1356 1359 1367 1378 1384 1387 1388 1389 1387 1392 1392 1398 1405 1408 1421 1435 1440
50	1251 1258 1262 1268 1275 1278 1282 1284 1288 1292 1295 1299 1307 1309 1310 1317 1318 1332 1338 1347 1348 1353 1355 1356 1359 1367 1378 1384 1387 1388 1389 1387 1392 1392 1398 1405 1408 1421 1435 1440 1455 1463 1464 1468 1468 1473 1478 1488 1491 1499

C. Employee Shortfall Analysis

Table III represents the shortfall of number of employees in each department of the IBM Company. This proposed model shows its efficiency in all respect either it is required for decision for promotion or to forecast the future shortfall of employees in any project. This is quite helpful in deciding before assigning any project to a particular group. So, that attrition nature of each group will be forecasted in prior and helps in deciding or preparing backup in emergency situations.

Table III: Employee Shortfall Analysis

Project Groups	Number of Employee Shortfall in Each Department		
	Human Resources	Research and Development	Sales
10 Employees Each Dept.	1	1	2
20 Employees Each Dept	1	1	2
30 Employees Each Dept.	3	3	2
40 Employees Each Dept.	4	5	3

50 Employees Each Dept.	4	5	5
All Employees Each Dept.	6	68	39

Table IV: Comparative Performance Evaluation

Methodology	Accuracy	R^2	MAPE
F-score LSTM	94%	0.086	10
TSF [9]	-	0.59	18
Random Forest [1]	91.4%	-	-

The table IV and figure 4 gives a comparative result analysis of proposed work with existing work that was performed on three different classifiers such as Random Forest (RF), Support Vector Machine (SVM) and K-Nearest Neighbor (K-NN). The result shows the enhancement of proposed work with approx. 2% and the work is also extended towards the finding employees which can be selected for providing bonus or promotion which was not discussed in existing work.
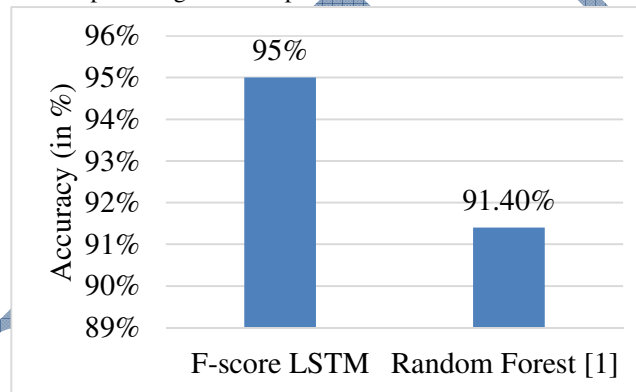

Figure 4: Comparative Accuracy Evaluation

The figure 4 gives a comparative result analysis of proposed work with existing work that was performed on classifier such as Random Forest (RF) [1]. The result shows that the efficiency of model shows enhancement of proposed work with approx. 4% and the work is also extended towards the finding employees which can be selected for providing bonus or promotion which was not discussed in existing work.
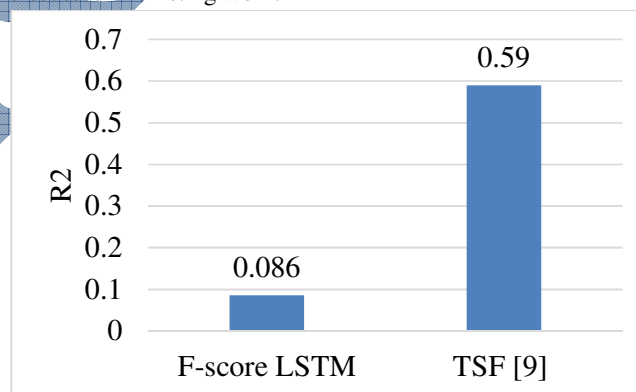

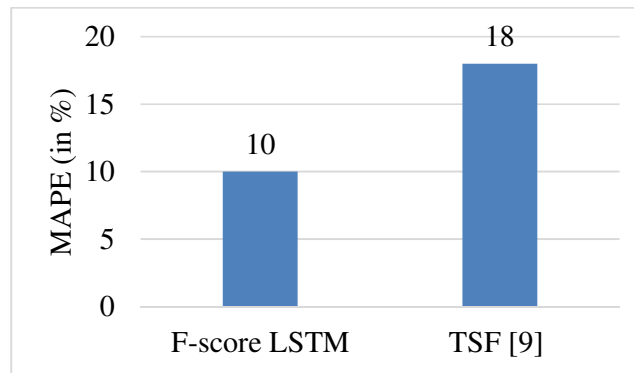**Figure 5: Comparative R^2 Evaluation**

Figure 6: Comparative MAPE Evaluation

The figure 5 and figure 6 gives a comparative result analysis of proposed work with existing work that was performed on Time Series Forecasting (TSF) [9]. The result shows that the efficiency of model shows enhancement of proposed work with approx. 15% on R^2 and 8% enhancement on MAPE. The work is also extended towards the finding employees which can be selected for providing bonus or promotion which was not discussed in existing work.

V. CONCLUSION

Employees' Attrition can affect an organization in many ways like goodwill, revenues and cost in terms of both time and money. The predictive attrition model helps in not only taking preventive measure, but also making better hiring decisions as well as providing appreciations to best employees that contributes to the benefit of the organization. IBM HR analytical dataset is used in order to evaluate the performance. The methodology uses three techniques i.e. LSTM and Fuzzy logic. The proposed methodology works in different levels termed as multi-agent architecture:

i.   The first agent is termed as Information Selection Agent (ISA) which handover dataset to second agent termed as Attrition Detection Agent (ADA).

ii.   Attrition Detection Agent (ADA) finds relationship between features or employees' information, F-score Co-relation are evaluated for feature selection. Attrition Detection Agent (ADA) classifies new employees for their attrition behavior using LSTM.

iii. In last Non-attrition employees and not decidable employees are further considered for appreciation for which Appreciation Providing Agent (APA) are activated and generates the list of selected candidates which is further considered for bonus/promotion distribution.

Some of the important facts analyzed and concluded in this work are stated as below:

i.   In this research work, LSTM is designed to predict attrition behavior of the employees. The result shows that the accuracy of model is approx. 95% and shows improved performance with existing methods by approx. 15% on R^2 and 8% enhancement on MAPE.

ii.   This model is quite efficient for finding eligible candidates for finding and sorting the best and deserving candidates.

iii. This model also gives motivational message to existing employees to do their work with dedication and deserving candidates will definitely get promotion/bonus without any partiality.

iv.   This model can also decides to give forecasting for shortage of trained employees with respect to department and can give an alert message for hiring new employees or to distribute work load among existing employees.

v.   This decision support system also efficient with respect to time.

vi.   This model gives decision for bonus and promotion without any partiality and indirectly helps in development of the organization.

Based on the above discussions, it can be said that the scope for future research can be the study conducted in different geographic regions like different countries, states, different industries with more variations in the socio-economic profiles, between Indian IT companies and MNC's etc. Future research can take place so as to enrich the research work as over a period of time, factors like employees' awareness and information about the strategies may change. Researchers will be encouraged to create and develop new constructs related to the retention of employees in the IT Service Industry.

REFERENCES

[1]   Alduayj, Rajpoot, "Predicting Employee Attrition using Machine Learning", International Conference on Innovations in Information Technology, IEEE, 2018.

[2]   Umang Soni, Navjot Singh, Yashish Swami, Pankaj Deshwal, "A Comparison Study between ANN and ANFIS for the Prediction of Employee Turnover in an Organization", International Conference on Computing, Power and Communication Technologies (GUCON), IEEE, 2018.

[3]   Dilip Singh Sisodia, Somdutta Vishwakarma, Abinash Pujahari, "Evaluation of machine learning models for employee churn prediction", International Conference on Inventive Computing and Informatics (ICICI), IEEE, 2018.

[4]   Ford Whitman Harris, "Economic Order Quantity Model", Institute for Operations Research and the Management Sciences (INFORMS), 24 December 2018.

[5]   Pikulkaew Tangtisanon, "Web Service Based Food Additive Inventory Management with Forecasting System", International Conference on Computer and Communication Systems (ICCCS), 2018.

[6]   Mitkees, Ibrahim MM, Sherif M. Badr, and Ahmed Ibrahim Bahgat ElSeddawy, "Customer churn prediction model using data mining techniques", Computer Engineering Conference (ICENCO), IEEE, 2017.

[7]   Dolatabadi, S. H., & Keynia, F., "Designing of customer and employee churn prediction model based on data mining method and neural predictor", International Conference on Computer and Communication Systems (ICCCS), 2017, pp. 74-77.

[8]   Franciska, I., & Swaminathan, B., "Churn prediction analysis using various clustering algorithms in KNIME analytics platform", International Conference on Sensing, Signal Processing and Security (ICSSS), 2017, pp. 166-170.

[9]   Xiaojuan Zhua, William Seaverb, Rapinder Sawhneya, Shuguang Jia, Bruce Holta, Gurudatt Bhaskar Sanila and Girish Upretia, "Employee turnover forecasting for human resource management based on time series analysis", Journal of Applied Statistics, 2016.

[10]   Tereza Sustrova, "A Suitable Artificial Intelligence Model for Inventory Level Optimization", Trends Economics and Management, vol. 10, 2016, pp. 48-55.