

**EMERGING TRENDS IN MULTI
DISCIPLINARY RESEARCH
AND INNOVATIONS
(Book Chapter)**

Editor

Dr. Sourabh Jain



RFI *Publication*
International Book Publication

First Edition 2022
ISBN – “978-93-91903-89-3”
Price: 350 INR
Size: A4

Copyrights © 2022
All rights reserved.

Bibliographic Information:

Title:

**Emerging Trends in Multi Disciplinary Research and Innovations
(Book Chapter)**

Editor

Dr. Sourabh Jain

Publisher

RFI

Year - 2022



RFI Publication
International Book Publication

Publisher:

Publisher & Editor in Chief, RFI (registered under the government of India
book Publication acts) India.

www.publication.rfindia.com

Printing & Publisher Address:

RO-K185, Ground Floor Sarita Vihar, New Delhi 110076

HO-207, Jai Prakash Nagar, RFI Tower, JBP 482002

Acknowledgement

*I would like to express my sincere gratitude to all the authors, researchers and reviewers, who provided their detail research and views for “**Emerging Trends in Multi Disciplinary Research and Innovations (Book Chapter)**”. I would like to thank our Teacher family, who supported and encouraged our in spite of all the time it took me away from them. This book could see the light of day due to generous support from the **Research Foundation of India Publication**. This volume is wholly a collective venture. This cause would not have been possible without the great efforts paid by all the authors and I am sure their valuable contributions increased the significance of the book. The readers and beneficiaries vary from academicians, professional engineers and scientists, to undergraduate and graduate students from all over the country.*

Editors

TABLE OF CONTENTS

S. No.	NAME OF TITLE	P. No.
1	PREDICTION OF PM10 AND CO USING SUPORT VECTOR REGRESSION TO ANALYSES THE AIR QUALITY OF DHANBAD Uday Kumar Sinha, K. Bandyopadhyay and S. C. Dutta	01-06
2	APPLICATION OF GRAPH THEORY IN SOCIAL MEDIA TO CONNECT FRIENDS Ambrish Pandey and Dr. Chitra Singh	07-14
3	A SURVEY OF DATA WAREHOUSE ARCHITECTURE AND DATA MINING APPLICATION Raja Ram Dutta, Dr. Rahul Deo Sah, Dr. Dharm Raj Kumar, Dr. Rajendra Kumar Kumar, Dharm Raj Kumar	15-22
4	गांधीजी व्यक्तित्व और नेतृत्व : एक समीक्षा डॉ. अंजू सोनकर	23-28
5	SEMANTIC CLOUD: A LANGUAGE REPOSITORY USING WORD SENSE EMBEDDING Dr. Shreya N. Patankar	29-33
6	20TH CENTURY RENOWNED NOVELISTS AND THEIR CHOSEN THEMES – AN EXPLORATION Dr. Joghee Senthilkumar	35-44

PREDICTION OF PM10 AND CO USING SUPPORT VECTOR REGRESSION TO ANALYSE THE AIR QUALITY OF DHANBAD

Uday Kumar Sinha^{1,2}, K. Bandyopadhyay¹ and S. C. Dutta³

¹University Department of Physics, BBMK University, Dhanbad, Jharkhand, 828130

²Department of Vocational Studies, Guru Nanak College, Dhanbad, Jharkhand, 826001

³Department of CSE and IT, BIT – Sindri, Dhanbad, Jharkhand, 828123

*Corresponding Author: Uday Kumar Sinha, Department of Vocational Studies, Guru Nanak College, Dhanbad, Jharkhand – 826001

Abstract - In the present work, the air quality of Dhanbad has been studied during pre-lockdown, lockdown and post-lockdown periods. The data have been taken from the website of Central Pollution Control Board (CPCB), New Delhi for the period from April, 2019 to September, 2021. In this context, predictions for air pollutants, namely Particulate Matter (PM10) and Carbon Monoxide (CO) using Support Vector Regression (SVR) technique have been made and it is shown that Radial Basis Function (RBF) kernel shows almost same accuracy for both the pollutants whereas polynomial kernel exhibits greater accuracy for PM10 compared to that of CO and linear kernel demonstrates the reverse result. Present study shows that RBF Kernel function is the most suited prediction model among the three kernel functions showing highest accuracy ($\cong 65\%$) with minimum error (Mean Squared error $\cong 1\%$).

Keywords: CPCB, PM10, CO, SVR, RBF kernel, linear kernel, polynomial kernel.

1. INTRODUCTION

Pollution is an important issue of concern in present day civilization and it increases with the fast development of science and technology as side effects. It's affecting our environment by polluting air and water in everyday life, particularly in Dhanbad district. Although air and water pollution [1] have direct impact on human health but the present study is concerned with air pollution only. There are several causes of air pollution such as coal mining, factories, industries, burning of fossil fuels etc.

Dhanbad, the coal capital of India, is the second highest air polluted city of Jharkhand. PM10 [2] and CO [3] are two major pollutants considered in the present study because of their hazardous impact on human health. Hence, assessment of air quality is very much needed for necessary measurements to control the pollution level. For the assessment, Air Quality Index (AQI) [4] is important to specify how clear or pollutant the air is.

The analysis of air quality of Dhanbad district shows that RBF kernel function [5] predicts most accurate results with least error for both the pollutants PM10 and CO compared to polynomial and linear kernel methods.

The organization of the paper is as follows. Theory of Support Vector Regression is explained in brief in Section 2. Section 3 describes the methodology used for analysing the present problem. Experimental results are presented in Section 4. Section 5 contains conclusions of the present study.

2. THEORY OF SUPPORT VECTOR REGRESSION

It is well known that Support Vector Machines (SVMs) are supervised learning model and it can be used for both classification and regression analyses. Support Vector Machine [6] was introduced for classification and the major objective of SVM is to explore the optimal hyperplane between classes to separate the data. Support vectors are the points which are passing through the marginal plane of that classes. Kernel functions [7] are used for linear separation of the data points by projecting data points in higher dimensional space in case of nonlinear separation of data. The systematic diagram of linear SVM is given in Fig I.

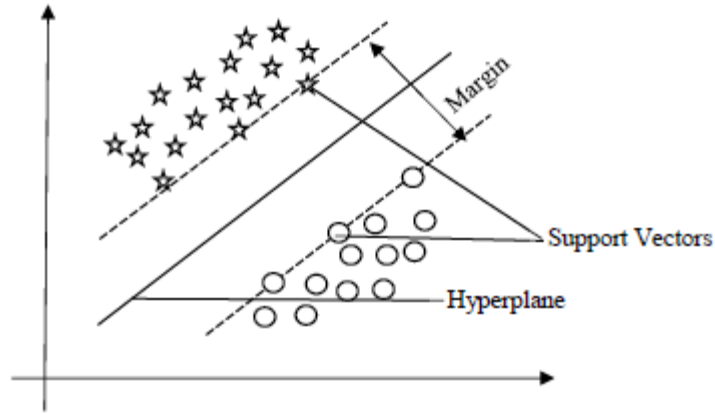


Fig. I: Systematic diagram of linear SVM

The SVM was used for regression problem after introduction of the loss function [8]. Many researchers [9-14] have worked on Support Vector Regression (SVR) for time series forecasting to achieve greater accuracy because SVR model offers better forecast capability and faster training and hence, SVR is used for the present purpose.

3. METHODOLOGY

In this section data collection, data pre-processing, designing of SVR model and criteria for evaluating the performance have been discussed for prediction of PM10 and CO as air pollutants.

3.1 Data Collection

The datasets used in the present work have been collected from the website of Central Pollution Control Board (CPCB), New Delhi [15]. Data for analysis of air quality have been taken from Continuous Ambient Air Quality Monitoring Station (CAAQMS) [16], situated at Tata Stadium, Jorapokhar, Dhanbad, Jharkhand. The datasets consist of concentrations of pollutants as well as meteorological factors and the total number of features in the datasets is ten, namely Particulate Matter(PM10), Nitric Oxide(NO), Nitrogen Dioxide(NO2), Ammonia(NH3), Sulphur Dioxide (SO2), Carbon Monoxide(CO), Ozone(O3), Temperature(temp), Relative Humidity(RH) and Solar Radiation(SR).

3.2. Data Pre-Processing

The accuracy of forecasting of a model depends on the quality of data and proper data representations. The standard steps for pre-processing of data [17] include: (i) Imputing missing values, (ii) Removing outliers, (iii) Feature scaling and (iv) Feature selection.

Performance of these steps on datasets are as follows:

- (i) Imputing Missing Values:** Missing data are substituted by linear interpolation estimation using nearest available data points for analysis.
- (ii) Removing Outliers:** An irregular pattern was observed for CO between October, 2019 and November, 2019 and hence, values of this parameter for this period were removed.
- (iii) Feature scaling:** Feature scaling is one of the most important data pre-processing steps for designing a predictive model. In this step, Min-Max scaling is used in which values are shifted and rescaled in the range between 0 & 1. The formula for getting the normalized value (X') is

$$X' = \frac{X - X_{min}}{X_{max} - X_{min}}$$

Where, X , X_{max} and X_{min} are the original, maximum and minimum values of the features, respectively.

(iv) Feature selection: From the features available, a few features were selected to reduce dimensionality of the dataset and also to remove collinearity. Pearson's Correlation coefficient method [18] for feature selection is used to check collinearity among features.

3.3. Designing of SVR Model

In SVR model various popular kernel functions are available that can be used to transfer data into high dimensional feature space such as liner kernel, polynomial kernel, radial basis function kernel (RBF), sigmoid kernel etc. In this work, RBF, Polynomial and Linear kernel functions of SVR model are used for the above mentioned purpose. In addition to kernel functions other important parameters like error acceptance (ϵ) and regularization constant (C) are also considered for the present work. It is to be noted that Grid Search CV [19] method is used to obtain best values of ϵ and C.

Python 3.7.6 [20] is used for the development of the model on 64 bit machine having 4GB RAM, 2.2Ghz Intel core i3 CPU, and Matplotlib [21] and Seaborn [22] are used for standard plotting whereas sklearn [23] package is utilized for learning and prediction of the model. Pandas [24] dataframe are applied to perform majority of the works. The dataframe is partitioned into training set and testing set in the ratio of 7:3 and the above mentioned kernel functions of SVR model are trained using the training set and then model is evaluated using the testing data set.

3.4. Criteria for Evaluating the Performance

The performance of a model for prediction of AQI is measured by statistical metrics like R Squared (R²), Mean Absolute Error (MAE), Mean Squared Error (MSE) and Root Mean Squared Error (RMSE) and these are explained as follows [25].

R-Squared (R²) is a statistical measure in a regression model that shows how well the data fit into a regression model. The higher the value is, the better the model is. It can be calculated as

$$R^2 = 1 - \frac{(y_i - \hat{y}_i)^2}{(y_i - \bar{y}_i)^2}$$

Where, y_i is the actual value of y , \hat{y}_i is the predicted value of y and \bar{y}_i is the mean value of y

Mean Absolute Error (MAE) represents the average of magnitudes of difference between the original and predicted for the data set. The formula for calculating MAE is:

$$MAE = \frac{1}{n} \sum_{i=1}^n |y_i - \hat{y}_i|,$$

where, y_i is the actual value of y , \hat{y}_i is the predicted value of y and 'n' is the number of errors.

Mean Squared Error (MSE) represents the mean of the squares of the difference between the original and predicted values for the data set and the necessary formula is given below.

$$MSE = \frac{1}{n} \sum_{i=1}^n (y_i - \hat{y}_i)^2,$$

where, y_i is the actual value of y , \hat{y}_i is the predicted value of y and 'n' is the number of errors.

Root Mean Squared Error (RMSE) is one of the most commonly used measures for evaluating the quality of predictions. It shows to what extent the predictions deviates from the true values and it can be expressed as,

$$\text{RMSE} = \sqrt{\frac{1}{n} \sum_{i=1}^n (y_i - \hat{y}_i)^2},$$

Where, y_i is the actual value of y , \hat{y}_i is the predicted value of y and 'n' is the number of errors.

4. EXPERIMENTAL RESULTS

The regression plots for each of the kernel functions for PM10 and CO have been drawn for SVR model. The performance of the models for both the pollutants are also shown in Table I and Table II, respectively.

4.1 PM10

The regression graphs for the kernel functions are shown in Figures II and III. The distribution plots are presented in Figure II whereas bar graphs are displayed in Figure III. The distribution plots exhibit the distribution of original and predicted values of the present problem. The accuracy and different types of errors expected are presented in Table I.

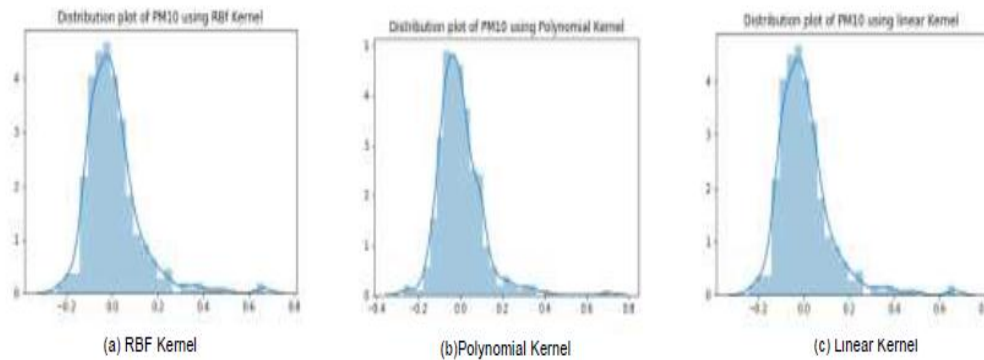


Figure II (a, b, c): Comparison of actual and predicted values of PM10 among the models

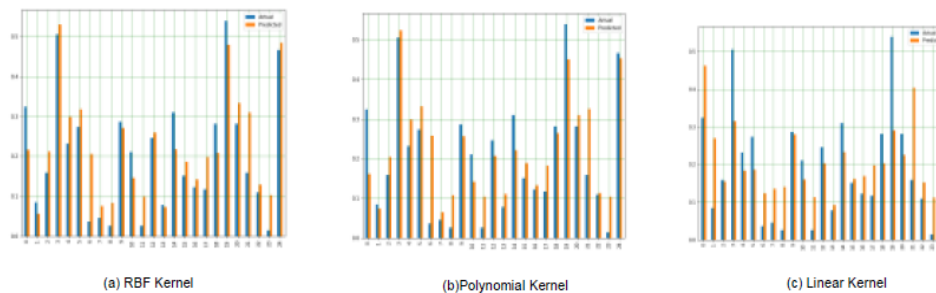


Figure III (a, b, c): Comparison of actual and predicted values of PM10 among the models

Here, blue colour represents actual values while orange represents predicted values

Kernel	R ²	MAE	MSE	RMSE
RBF	0.6478	0.0676	0.0089	0.0945
Polynomial	0.5670	0.0737	0.0105	0.1026
Linear	0.3859	0.0818	0.0140	0.1184

Table I: Comparison of accuracy of PM10 among the models

From Table I, it is observed that RBF kernel function gives least error in prediction with maximum accuracy than the other two kernels.

4.2. CO

Figures IV and V show regression graphs for the kernel functions for getting predicted values of CO with accuracy. Figure IV gives distribution plots and bar graphs are displayed in Figure V. The accuracy and different types of errors projected are shown in Table II.

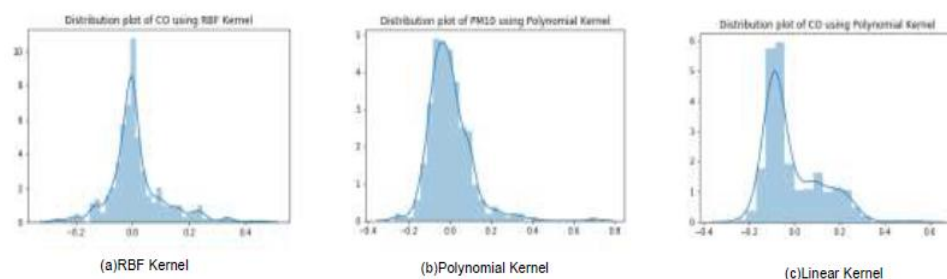


Figure IV (a, b, c): Comparison of actual and predicted values of CO among the models

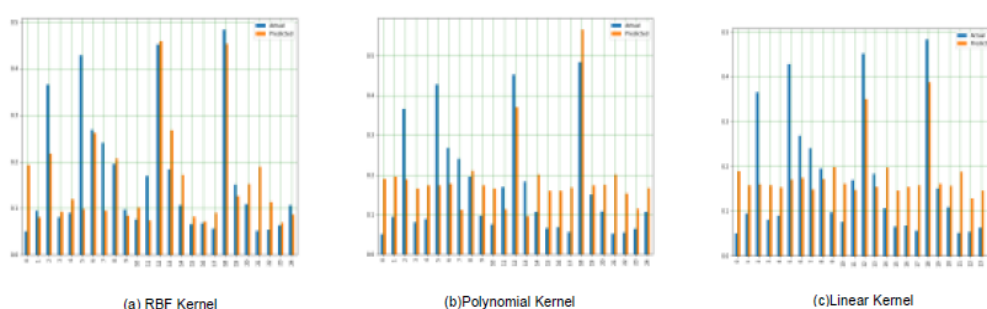


Figure V (a, b, c): Comparison of actual and predicted values of CO among the models

In Figure V actual values are represented by blue colour and predicted values are shown by orange colour.

Kernel	R ²	MAE	MSE	RMSE
RBF	0.6462	0.0648	0.0116	0.1079
Polynomial	0.4771	0.0891	0.0152	0.1232
Linear	0.4410	0.0936	0.0180	0.1343

Table II: Comparison of accuracy of CO among models

RBF kernel function gives rise to maximum accuracy with least error compare to other two kernels as shown in the above table.

5. CONCLUSIONS

In the present study it can be clearly stated that RBF kernel method predicts most accurate results ($\cong 65\%$) with least error (Mean Squared error $\cong 1\%$) for both the pollutants PM10 and CO for the data available in the website of CPCB for the analysis of air quality of Dhanbad district. Although polynomial and liner kernel methods may be considered as poor methods compare to RBF kernel method but polynomial method shows comparatively better accuracy and lesser values in error compared to liner kernel method.

REFERENCES

1. R. P. Singh, A. Chauhan, "Impact of lockdown on air quality in India during COVID-19 pandemic", *Air Quality Atmosphere and Health* 13, 921–928 (2020). <https://doi.org/10.1007/s11869-020-00863-1>
2. Neha Dubey and Shamsh Pervez, "Investigation of variation in ambient PM10 levels within an urban industrial environment", *Aerosol and Air Quality Research* 8.1 54-64 (2008).
3. S. K Guttikunda, R. Goel and P. Pant, "Nature of air pollution, emission sources, and management in the Indian cities", *Atmospheric environment* 95, pp.501-510 (2014).
4. CPCB National Air Quality Standard. Central Pollution Control Board, New Delhi (India); https://cpcb.nic.in/uploads/National_Ambient_Air_Quality_Standards.pdf (2009)

5. S. Han, C. Qubo and H. Meng, "Parameter selection in SVM with RBF kernel function", Proc. of World Automation Congress, Puerto Vallarta, Mexico, pp. 1-4 (2012).
6. C. Cortes and V. Vapnik, "Support-vector networks," Machine learning, vol. 20, no. 3, pp. 273-297, (1995).
7. A. Patle and D. S Chouhan, "SVM kernel functions for classification", Proc. of International Conference on Advances in Technology and Engineering (ICATE), Mumbai, India, pp. 1-9 (2013).
8. A. J. Smola and B. Scholkopf, "A tutorial on support vector regression", Statistics and computing, 14(3), pp.199-222 (2004).
9. S. Arampongsanuwat and P. Meesad, "Prediction of pm10 using support vector regression", Proc. Of International Conference on Information and Electronics Engineering, Bangkok, Thailand, vol. 6, (2011).
10. C. M. Vong, P. k. Wong, and J. Y. Yang, "Short-term prediction of air pollution in macau using support vector machines", Journal of Control Science and Engineering, vol. 2012, (2012).
11. V. Vapnik et al., "Predicting Time Series with Support Vector machines", Proc. of ICANN Lausanne, Switzerland, pp. 999-1004 (1997).
12. W. Lu, and D. Wang, "Ground-level ozone prediction by support vector machine approach with a cost sensitive classification scheme", Science of the Total Environment, vol. 395, pp. 109-116 (2008).
13. W. C. Leong, R. O. Kelan and Z. Ahmad, "Prediction of air pollution index (API) using support vector machine (SVM)", Journal of Environmental Chemical Engineering, 8(3), p.103208 (2020).
14. H. Weizhen et al., "Using support vector regression to predict PM10 and PM2. 5", Proc. of IOP conference series: earth and environmental science, Jakarta, Indonesia, Vol. 17, No. 1, p. 012268 (2014).
15. <https://www.cpcb.nic.in/>
16. <https://www.app.cpcbcr.com/ccr/#/caaqm-dashboard-all/caaqm-landing>
17. S. B. Kotsiantis, D. Kanellopoulos, and P. E. Pintelas, "Data preprocessing for supervised learning", International journal of computer science, vol. 1, no. 2, pp. 111-117 (2006).
18. J. Benesty, J. Chen, Y. Huang and I. Cohen, "Pearson correlation coefficient", Noise reduction in speech processing Springer, pp. 1-4 (2009)
19. Q. Huang, J. Mao, and Y. Liu, "An improved grid search algorithm of SVR parameters optimization", Proc. of IEEE 14th International Conference on Communication Technology, Chengdu, China, pp. 1022- 1026 (2012).
20. D. Parbat and M. Chakraborty, "A python based support vector regression model for prediction of COVID19 cases in India", Chaos, Solitons & Fractals, 138, p.109942 (2020).
21. J. D. Hunter, "Matplotlib: A 2D graphics environment", Computing in science & engineering, 9(03), pp. 90-95 (2007).
22. M. L. Waskom, "Seaborn: statistical data visualization", Journal of Open Source Software, 6(60), pp. 3021(2021).
23. F. Pedregosa et al, "Scikit-learn: Machine learning in Python", The Journal of Machine Learning research 12 pp. 2825-2830 (2011).
24. W. McKinney, "Pandas: A Foundational Python library for data analysis and statistics", Python for High Performance and Scientific Computing, 14(9), pp.1-9 (2011).
25. D. Chicco, M. J. Warrens and G. Jurman, "The coefficient of determination R-squared is more informative than SMAPE, MAE, MAPE, MSE and RMSE in regression analysis evaluation", PeerJ Computer Science, Vol 7, pp.623 (2021).

#####

APPLICATION OF GRAPH THEORY IN SOCIAL MEDIA TO CONNECT FRIENDS

Ambrish Pandey¹ and Dr. Chitra Singh²

¹Research Scholar, Department of Mathematics, Rabindranath Tagore University, Raisen-464993, Bhopal, MP, India

²Associate Professor, Department of Mathematics, Rabindranath Tagore University, Raisen-464993, Bhopal, MP, India

Abstract - Graph theory is a unique part of the discrete mathematics. It plays a vital role in the science and technology sector. In this research paper, we introduce the concept of Graph theory which is widely used in social media. Development has given rise to a strong demand for appropriate tools and methods provided by graph theory. Applications of graph theory are used to connect friends on social media. In social networking sites like WhatsApp, Facebook, Twitter, Messenger, LinkedIn etc. users are connected through a large graph. Here, we represent people or users by vertices, and any relationships between users, such as followers, friendships, likes, or subscriptions, are represented by edges. Graph theory is used to connect with people through viral videos. In this case each user is a vertex and when users connect, they form an edge. Strong and weak relationships on social media are represented by graph theory. Efficient results can be achieved by clarifying the methodology. Therefore, graph theory methods are centrally important for understanding the development of technology.

Keywords: Graph theory, Large graph, Social media, Technology, Viral video.

1. INTRODUCTION

Graph theory is a branch of discrete mathematics. In mathematics and computer science, graph theory is the study of graphs which are mathematical structures used to model pairwise connections between objects. Graph theory is a graphical representation of a collection of objects that are linked and studied essentially in computer science and mathematics. Graphs are extensively used in furnishing problem working ways, as it gives an intuitive view before presenting a formal description.

A graph is made up of nodes such that a social media can be quite a social network, where everyone or an organization represents a node. In extreme social media, these nodes are dependent on each another through common interests, relationships, mutual friends, knowledge, common dislikes, trust etc. The graphical structure of social media can be very complex, depending on which there are large nodes and thousands of relations on colorful grounds. Numerous experimenters have revealed that social network work at different situations and help in understanding numerous effects similar as how an entire association is run. It helps to know and understand numerous important problems.

The analysis of social media is a veritably useful tool for rooting knowledge from unshaped data. The knowledge gained from this field provides an in-depth knowledge of the different types of relations and relationship between different individualities on social media. In this, we have explained in detail about the various applications of graph theory on social media and how it is represented strong and weak relationship.

The social media network sites are currently available all over the planet with a large number of active users. With multiple rankings Facebook, Twitter and LinkedIn etc. have a better position among them. They are specially designed to interact with people. On the other hand, they differ in the way they set up their relationships and in terms their casualness and professionalism. Therefore, social network sites like WhatsApp, Facebook, Twitter, LinkedIn, etc. are evaluated during this analysis.

2. PRELIMINARIES

In this section, we memorize some basic concepts and definitions.

Definition 2.1. Let $V = \{v_1, v_2, \dots\}$ be the set of vertices and let $E = \{e_1, e_2, \dots\}$ be the set of edges. Then $G = (V, E)$ is said to be a graph or linear graph if every edges e_k is identified with an

unordered pair (v_i, v_j) of vertices where i, j, k are natural numbers. And the study of graphs is known as graph theory.

Definition 2.2. The arcs between two vertices have a specific direction is known as directed edge. They are directed from one vertex to another. It is represented by an arrow.

Definition 2.3. The edges do not have any particular direction from one vertex to another is known as undirected edge. There is no gap between two vertices connected by an undirected edge. It is represented by a straight line.

Definition 2.4. If a graph forms a cycle then it is called a cyclic graph. It is a closed figure that starts and ends at the same vertex.

Definition 2.5. If the graph does not form any cycles then it is called an acyclic graph.

Definition 2.6. If a graph has n number of vertices then the adjacency matrix of that graph is $n \times n$ matrix and every entry of the matrix represents the number of edges from one vertex to another.

If $M_{ij} = 1$, it means there is an edge connecting vertex i and vertex j and if $M_{ij} = 0$, it means there is no edge connecting vertex i and vertex j .

Definition 2.7. In Adjacency list, all the zeroes of the adjacency matrix are eliminated and only the corresponding neighboring nodes of a particular node are considered.

Definition 2.8. When a video reaches a specific number of connections or views, it is said to be viral.

Definition 2.9. A computer-based technology that facilitates the sharing of thoughts, ideas and information through virtual networks and communities is known as social media. It is internet based and provides instant transmission of content like personal information, documents, videos, and photos to the users.

Definition 2.10. Technology is the application of the knowledge base to the sensible purposes of human life or the transformation and manipulation of the human environment.

Property 2.11. Strong Triadic Closure Property– It is the property among three nodes A, B and C , such that if a strong tie exists between $A-B$ and $A-C$, there is a weak or strong tie between $B-C$.

3. MATERIALS AND METHODS

3.1. The construction of graph models

Social network sites like Facebook, Twitter and LinkedIn, WhatsApp, Messenger etc. have inherited many activities. Users can form new bonds with other users, they can post their photos on the network sites so that their friends can see them, or they can message them. These activities are carried out can be different from one network to another. The model of a social network describes a graph with many nodes and edges in relation to each activity on the network sites. Therefore, a number of sub-graphs can be extracted and analyzed to predict the behavior patterns of users within the network. The following are the built models of social network sites like Facebook, Twitter, LinkedIn etc.

3.1.1. Facebook Network Model

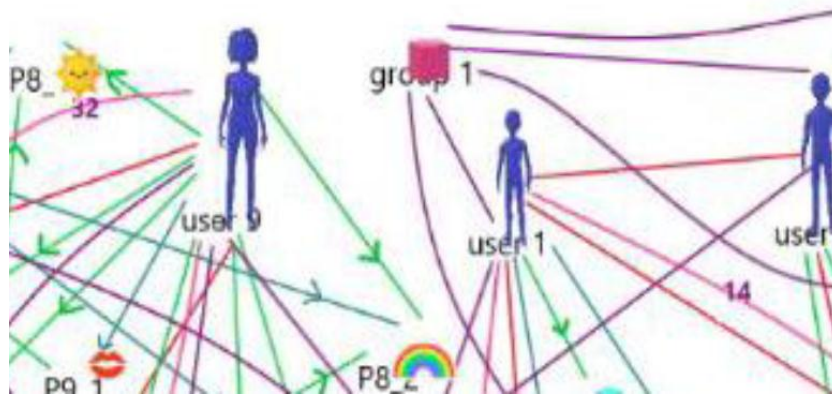


Figure 1- Facebook network model.

In this model, we describe three types of nodes namely Users, Posts and Groups. The links represent friendship (red), responses to posts (green), post creation (blue), messages (pink) and group membership (purple). We draw four sub graphs to analyze the Facebook user's behavior which are; Friendship graph, Post reaction graph, Groups graph, Messaging graph.

3.1.2. Twitter Network Model

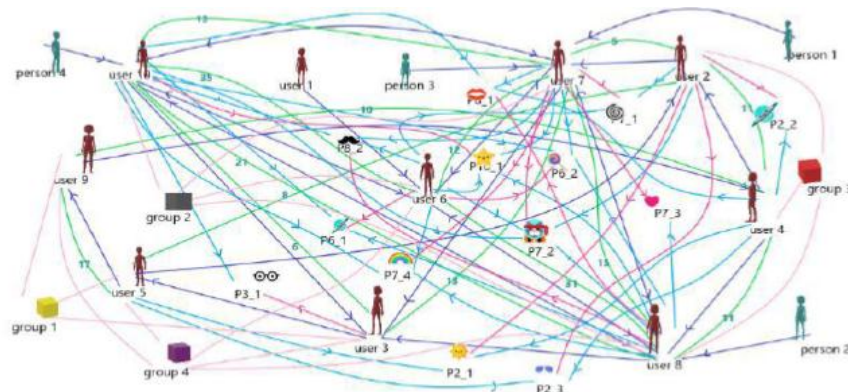


Figure 2- Twitter network model.

In this model, we represent users, unregistered persons, posts and groups as nodes. Here the links represent; post reaction (light blue), post creation (dark pink), messages (green), group membership (light pink) and following (dark blue). It also has four sub-graphs that can be extracted from which some of Facebook's graphs that can have different characteristics. The sub-graphs of Twitter network model are; Groups graph, Post response graph, Messaging graph and Followers graph.

3.1.3. LinkedIn Network Model

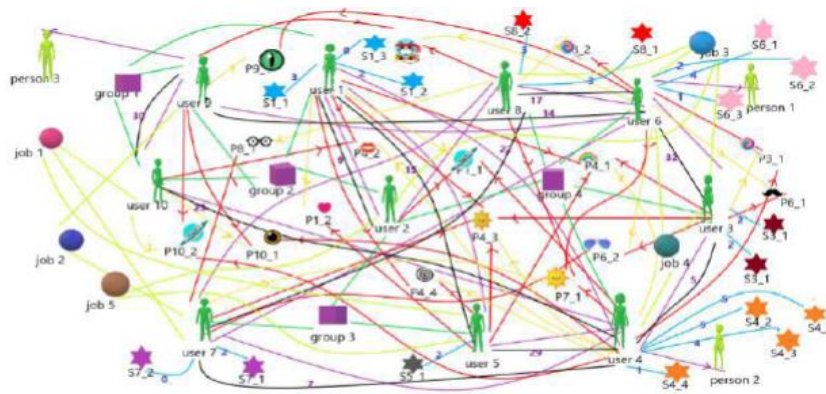


Figure 3- LinkedIn network model.

In this model, users, unregistered individuals, posts, groups, skills and jobs represent nodes of the graph. Here the links and their colors are; Connections (purple), Group membership (green), Posting (gold), Post reactions (red), Messages (black), Support (blue), invitation (purple directed), job recommendation (light green). We draw six sub graphs to predict meaningful outcomes on LinkedIn's user behavior. The sub-graphs are; Groups graph, Connections graph, Graph for feedback on posts, Messaging graph, Graphs for skill support and job recommendation graph.

3.1.4. Social Network

Consider a graph $G = (U, L)$, where U is an ordered pair of a unit or vertex set and L is a line set. Then a network N containing G can be defined as:

$$N = (U, L, FU, FL)$$

So, this can be extended with a function FU that specifies a vector of properties of units ($f: U \rightarrow X$) and a function FL that specifies a vector of properties of lines ($f: L \rightarrow Y$).

The set of lines L can be thought of as the union of a set of undirected edges E and a set of directed arcs A ($L = E \cup A$).

Every element 'e' of E (each edge) is an unordered pair of units u and v (vertices) from U , that is, $e(u: v)$, and every element 'a' of A (each arc) is an ordered pair of units u and v (vertices) from U , i.e., $a(u: v)$.

3.2. Analysis of a sample

The samples for social network sites such as Facebook, Twitter LinkedIn etc. are created using software, Gephi.

Here we use Barabasi-Albert network construction method to generate the graphs. This method is a MATLAB code that generates an adjacency matrix to represent a network. The Barabasi-Albert algorithm is specifically written to generate scale-free networks. So, the adjacency matrix can be input into Gephi to develop the corresponding graph. If the social network sites have common sub-graphs then a graph is constructed. Therefore, the constructed graphs are analyzed to determine the behavior patterns of users within each social network. Thus, we have the following generated graphs:

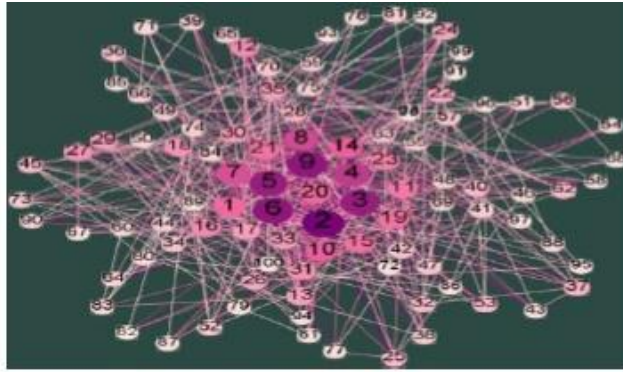


Figure 4- Facebook friendship graph

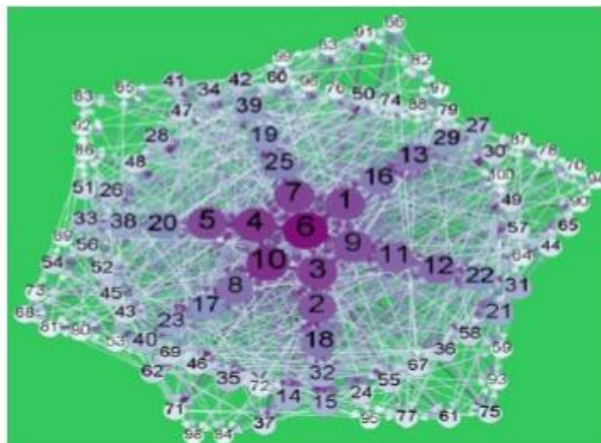


Figure 5- Twitter friendship graph

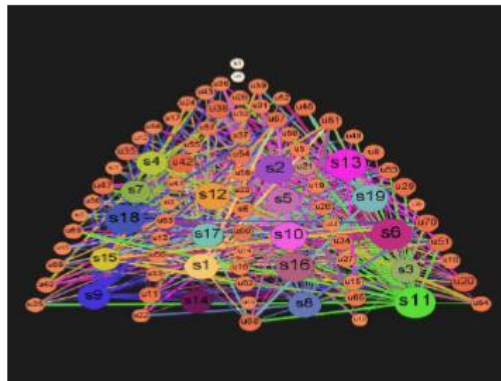


Figure 6- LinkedIn friendship graph.

4. APPLICATIONS OF GRAPH THEORY IN SOCIAL NETWORKING SITES

The concept of graph theory is widely used in social media to connect friends. Usually here the users or the people involved are considered as nodes or vertices. And any relationship between users because of common liking or mutual friendship is treated as edges.

4.1. Graph Theory in WhatsApp: Graphs are widely used to model social structures based on different types of relationships between people or groups of people. WhatsApp media can be easily modeled using graphs, the relationship between individuals in WhatsApp media can be described using graphs involving two individuals and communicating from different WhatsApp groups, it can be restated by graphs can be explained. The idea of directed graphs, undirected graphs and adjacency matrix as it relates to WhatsApp group is presented.

4.2. Graph Theory in Facebook: Nowadays most of the people are familiar with Facebook. If we like something we can click 'Like', 'tag' our friends in various 'posts', put comments in the post and most importantly, what we know and Befriend what we don't! The concept of graph theory is used in Facebook to like, share, comment, tag, each person as nodes and each as edges.

4.3. Graph Theory in Twitter: Here persons are considered as nodes and if one person follows another then he is considered as the edge between the two.

4.4. Graph theory in Messenger: Here the postman makes as many rounds as possible to reach the letters to each person. Finally the function of adding the shortest route to a number of points whose pairwise distances are known. The concept of graph theory is used in Messenger with each individual as nodes and each route travelled by postman as edges.

4.5. Graph theory in LinkedIn: In this one person adds a contact, the application looks for other people within the network of both contacts of both to one another. Here, individuals are considered as vertices and contacts between individuals are considered as edges.

5. RESULTS AND DISCUSSION

This analysis is based on results obtained from Gephi. The outputs of various graph theory properties are given as scatter plots where x-axis and y-axis represent the value of a particular asset and the number of users holding each value for the relevant assets.

5.1. Facebook friendship graph

Consider the Graph density of graph is 0.1. Therefore, the general level of connectedness of this graph is very low because it is much less than 1. Here, the average path length is 2.257. So, the average degree in this network is 9.88. Therefore, the most Facebook users have degree 5. User 82 has a minimum degree which is 4 and user 2 has maximum degree which is 32. Thus, user 2 has the most friends and the greatest potential to influence other users within the network. We have the following figure which represents the power law distribution of degree of users in the network:

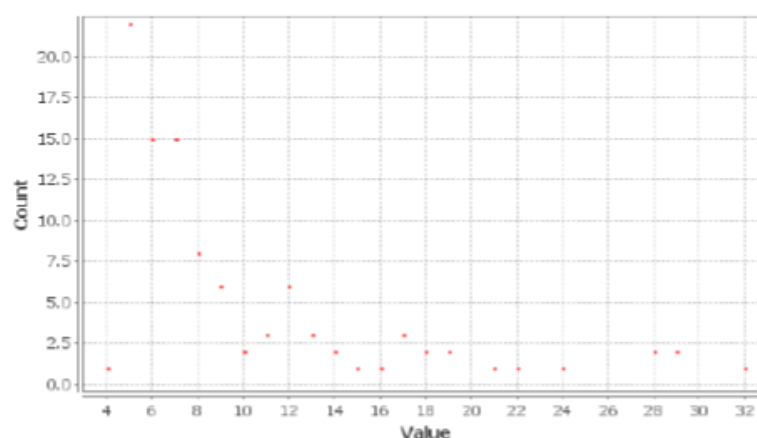


Figure 7. Facebook friendship graph.

5.2. Twitter friendship graph

Consider the density of this network is 0.102. Then as the Facebook friendship graph, this network has a very low general level of connectivity. Consider the average path length is 2.373. Then a user in the network can communicate on average with another user through about 2 steps on average. As in 'Fig. 8', in-degree defines a user to be followed by other users in the network. Each user has a degree of 8, 9, 10, 11 or 12 according to this chart. User 28, 8, 2 and 7 have a

minimum degree of 9 and user 11 has a maximum of 12 degree. Therefore, user 11 has the maximum number of followers and is the most popular within the network.

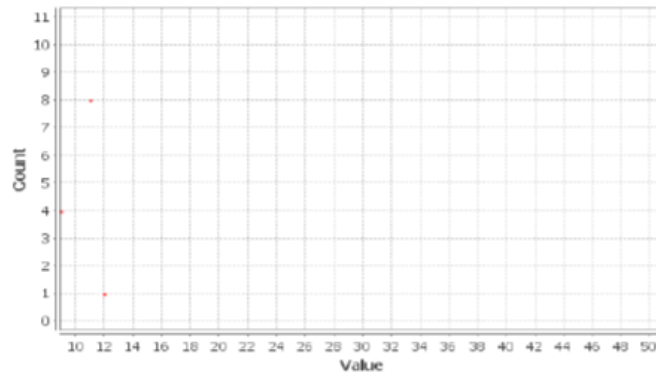


Figure 8. Twitter friendship graph.

5.3. LinkedIn friendship Graph

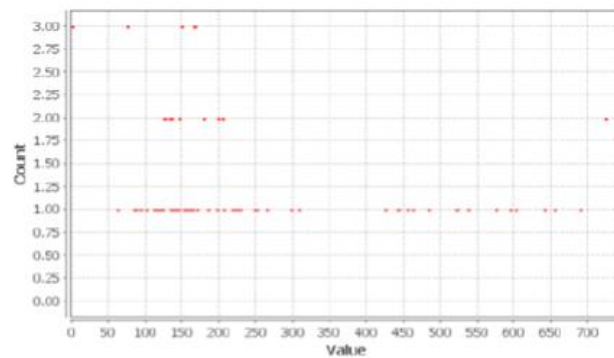


Figure 9- LinkedIn friendship graph.

In this graph, the weighted degree distribution defines the number of supports for a user’s skill. Here, the average weighted degree of the network is 239.244. Users 3 and 4 have no skills supported. User 81 has a maximum weighted degree with an approved skill. So, user 81 is a person highly recommended by his friends as the most skilled person in this network.

5.4. Social Network of friends

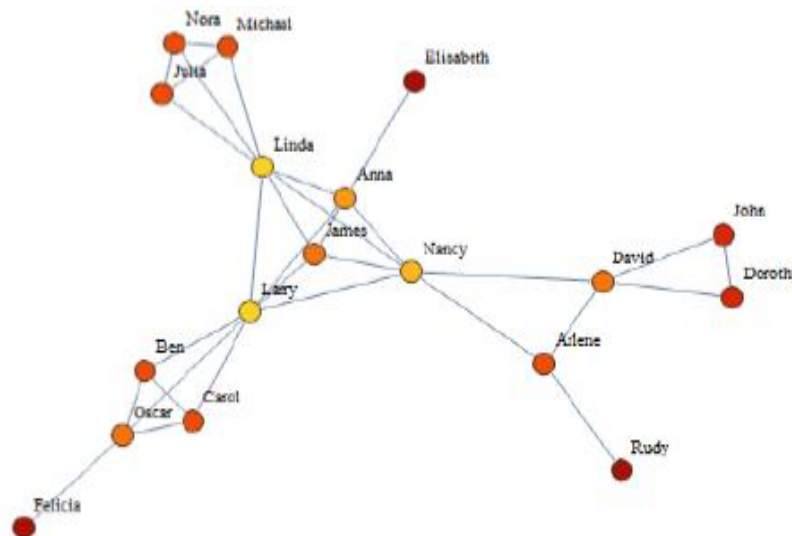


Figure 10- Social Network of friends.

In this network, we denote the relation of a particular group of friends, and we represent each vertex by four different colors which is a major figure in the friendship. Also, the edges represent a connection from any type of relationship and interaction.

6. CONCLUSION

In this paper, we have discussed about various aspects of graph and its basic properties. Graphs are used in social network sites whose complexity is increasing with the progress of adding friends on social media. The main objective of this paper is to present the importance of graph theoretical ideas in various fields of technical applications. This paper focuses on the various applications of major graph theory in social media to connect friends. Various activities of WhatsApp, Facebook, Twitter, LinkedIn etc. can be identified and a suitable graph model can be constructed for each social media to represent the related activities. By evaluating the graph theory properties of social network sites, valuable information can be obtained on user behavior that is beneficial to both the user and the company. User can improve his profile to increase his performance level within the network.

REFERENCES

1. Acemoglu, D. and Ozdaglar, A. (2009). "Networks, Lecture 2: Graph Theory and Social Networks", September 14, 2009.
2. Ahmed, Shamim (2012). "Applications of Graph Coloring in Modern Computer science". International Journal of Computing and Information Technology, issn 2078-5828 (print), issn 2218-5224 (online), volume 03, issue 02, manuscript code: 130101(2012).
3. Badwaik Jyoti S. (2020). "Recent Advances in Graph theory and its applications". International Res. Journal of Science & Engineering, 2020; Special Issue A7: 533-538, ISSN: 2322-0015.
4. Bindu, C. Shoba and Dhanasree, K. "Graph Theory: Applications in Various Fields," Dept. of CSE, JNTUA College of Engineering, Anantapur.
5. Deo, N. (2017). Graph theory with applications to engineering and computer science. Courier Dover Publications.
6. Deswal, Suman; Singhrova, Anita (2012). "Application Of Graph Theory In Communication Networks," International Journal of Application or Innovation in Engineering & Management (IJAIEEM), Volume 1, Issue 2.
7. Dickinson, Sven; Pelillo; Zabih, Ramin (2001). "Introduction to the analysis" Vol 23 No. 10, September 2001.
8. Hwere, T. S.; Isa, R. S. and Hosea Yakubu (2020). "Graph Models Of Social Media Network As Related To Whatsapp Groups". International Journal of Innovative Mathematics, Statistics & Energy Policies, 8(1):24-31, 2020.
9. Lanel, G. H. J.; Jayawardena, H. S. S. P. (2020). "A Study on Graph Theory Properties of On-line Social Networks". International Journal of Scientific and Research Publications, 10(3): p9929, DOI:10.29322/IJSRP.10.03.2020.p9929.
10. Mince, M.; Szykiewicz, E. N. (2012). "Application of Social Network Analysis to the Investigation of Interpersonal Connections". International Journal of Computer Science and Engineering.
11. Pal, A. J.; Sarma, S. S.; Ray, Biman (2007). "CCTP, Graph Coloring algorithms – Soft computing Solutions IEEE, 2007.
12. Rani, N. S.; Suman, S. P. (2013). "The role of data structure in multiple disciples in computer science," International Journal of Scientific & Engineering Research, Volume 4, Issue 7, July 2013.
13. Riabov, V. V. (2007). "Graph theory application in developing software test strategies for networking system".
14. Shirinivas, S. G.; Vetrivel, S.; Elango, N. M. (2010). "Applications Of Graph Theory In Computer Science An Overview". International Journal of engineering Science and Technology. Vol. 2(9), 2010, 4610-4621.
15. Singh, Pal Rishi; Vandana (2014). "Application of Graph Theory in Computer Science and Engineering," International Journal of Computer Applications. (0975 – 8887) Volume 104 – No.1.

#####

A SURVEY OF DATA WAREHOUSE ARCHITECTURE AND DATA MINING APPLICATION

Raja Ram Dutta

Assistant Professor, Birla Institute of Technology, Mesera

Dr. Rahul Deo Sah

Assistant Professor, Dr. Shyama Prasad Mukherjee University, Ranchi

Dr. Dharm Raj Kumar

Assistant Professor, Dr. Shyama Prasad Mukherjee University, Ranchi

Dr. Rajendra Kumar Kumar

Assistant Professor, Dr. Shyama Prasad Mukherjee University, Ranchi

Dharm Raj Kumar

Lecturer, Dept of Computer Application, J. N. College, Dhurwa, Ranchi

Abstract - Data warehousing methodologies share a common set of tasks handling large database including business requirement analysis, architectural design, implementation and deployment. The primary objective of the study is to investigate the architecture of the data warehouse and its application in data mining technique. Data warehouse and data mining are essential element of decision support which has increasingly become a focus of the database industry. Data warehousing is a collection of decision support technologies aimed at enabling the knowledge worker (executive, manager, and analyst) to make better and faster decision. In an uncertain and highly competitive business environment, the value of strategic information systems such as these are easily recognized however in today's business environment, efficiency or speed is not the only key for competitiveness. This type of huge amount of data's are available in the form of tera- to peta-bytes which has drastically changed in the areas of IT industry. To analyze, manage and make a decision of such type of huge amount of data. We need techniques called the data mining which will transforming in many fields. This paper identifies some of the promising research issues, some of the problem of database research in data ware housing, different technique of data mining.

Keywords: Data Warehouse, Data Mining , Data warehouse Architecture.

1 INTRODUCTION

Data Integration Technologies have experienced explosive growth in the last few years, and data warehousing has played a major role in the integration process. W.H In mon define as, Data Warehousing is a subject-oriented, integrated, non-volatile, time-variant collection of data that supports managerial decision making of the management. Data warehouses provide controlled access to data for complex analysis, knowledge discovery, and decision making.

1.1 Data, Information, and Knowledge

➤ Data

Data are any facts, numbers, or text that can be processed by a computer. Today, organizations are accumulating vast and growing amounts of data in different formats and different databases. This includes:

- Operational or transactional data such as, sales, cost, inventory, payroll, and accounting.
- Nonoperational data, such as industry sales, forecast data, and macro economic data.
- Meta data - data about the data itself, such as logical database design or data dictionary definitions.

➤ Information

The patterns, associations, or relationships among all this data can provide information. For example, analysis of retail point of sale transaction data can yield information on which products are selling and when.

➤ **Knowledge**

Information can be converted into knowledge about historical patterns and future trends. For example, summary information on retail supermarket sales can be analyzed in light of promotional efforts to provide knowledge of consumer buying behavior. Thus, a manufacturer or retailer could determine which items are most susceptible to promotional efforts.

2 BUILDING A DATA WAREHOUSE (DW)

The data warehouse is a data structure that optimized for distribution, mass storage and complex query processing. It stores integrated set of historical data from multiple operational systems and feed them into one or more data mart which are data structures that are optimized for faster access. A data warehouse potentially provide numerous benefits to an organization with quality improvement, and decision support by enabling quick and efficient access to information from multiple sources.

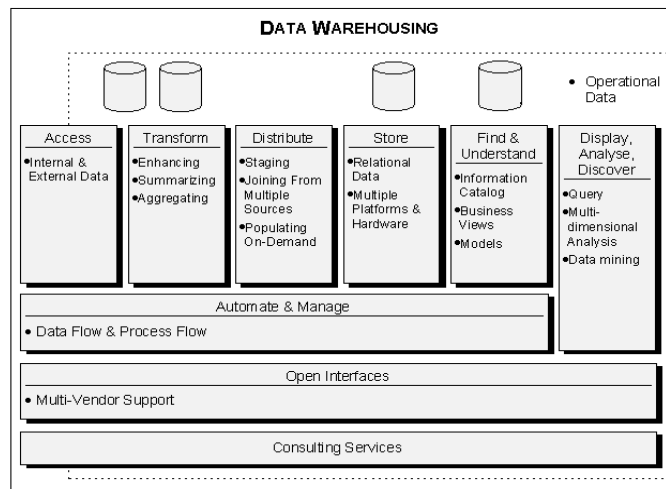


Fig. 1 Data Warehousing Life Cycle

The data warehouse technologies use very diverse vocabulary. Lifecycle of DW has five phase:

1. Design
2. Prototype
3. Deploy
4. Operation
5. Enhancement

Data Mart: Data Mart can be considered as the database or collection of databases that are designed to help managers in making strategic decision.

2.1 Data Mining

Data Mining is the process of automatic extraction of information or pattern from the data in large databases. It analyses data from different perspectives and summarizing it into useful information. Data mining software is one of a number of analytical tools for analyzing data. It allows users to analyze data from many different dimensions or angles, categorize it, and summarize the relationships identified. Technically, data mining is the process of finding correlations or patterns among dozens of fields in large relational databases.

Information sources which are integrated in the DW are autonomous and they can change their schema independently of DW. Such changes must be supported when they rich the DW. In fact, the DW technology is seen as the process of good decision making since it provides necessary tools for data analysis such as the On Line Analytical Processing (OLAP). Now-a-days , different database is providing data warehouse technologies - Oracle Database 11g is manager integration and load quality of data and support complete with in-database analytics, offer fast,

reliable and secure reporting on a low-cost platform and scalable for data warehouses. Microsoft SQL Server 2012, IBM DB2 and open source My SQL is also support data warehouse and business intelligence. One reason for this transformation is that data warehouses are on the front lines of the Big Data explosion. Not only do companies need to manage and store hundreds of terabytes to petabytes of data, they also need to find ways to extract the maximum value from this torrent of increasingly complex and diverse information—including unstructured or schema-less data—that is being generated at an escalating rate.

3 ONLINE ANALYTICAL PROCESSING (OLAP)

Online Analytical Processing (OLAP) is an approach for performing analytical queries and statistical analysis of multidimensional data. OLAP tools can be put in the category of business intelligence tools along with data mining.

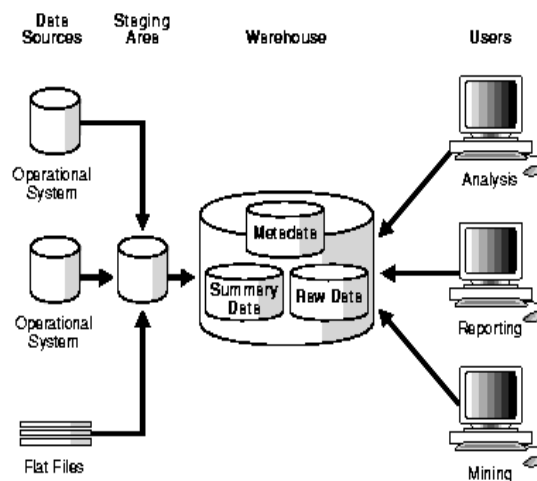


Fig. 2 Online Analytical Processing

4 DATA WAREHOUSE ARCHITECTURE

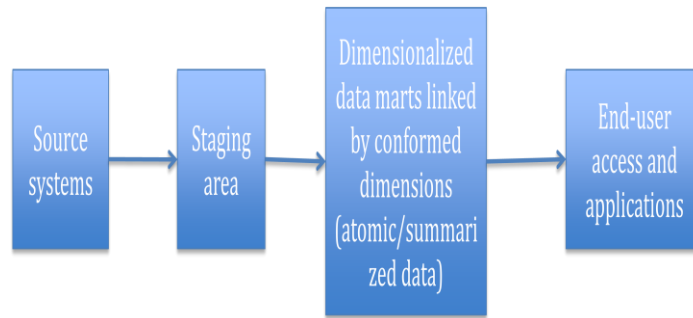
The review of the available literature on data warehouse has identified five predominantly architectures i.e Independent data mart, bus architecture, hub and spoke, centralised and federated. [1],[2],[3],[4],[5]

4.1 Independent Data Mart



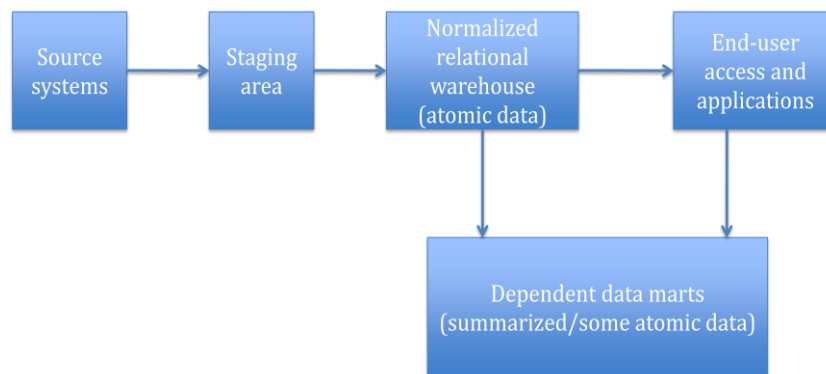
4.2 Bus Architecture

- Creation starts with a business requirements analysis for a specific process such as orders, deliveries, customer calls, or billing.
- One mart is created for a single business process
- Additional marts are developed using the Data marts that are independent of each other
- Often created by organization units
- Inconsistent data definitions and different dimensions and measures



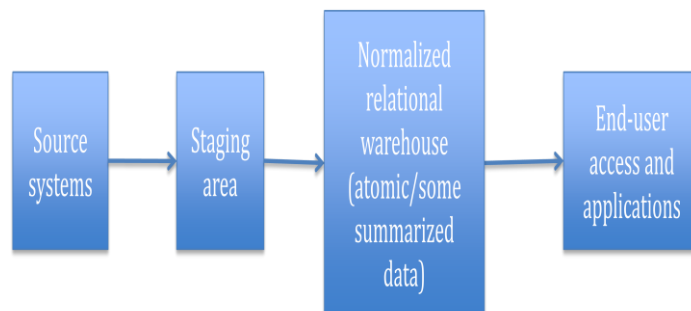
4.3 Hub and Spoke

- Developed after an enterprise-level analysis of data requirements.
- Focused on building a scalable and maintainable infrastructure.
- Developed in an iterative manner.
- Dependent data marts obtain the data from the warehouse.
- Consist of a centralized hub that accepts requests from multiple applications that are connected through spokes.



4.4 Centralized Data Warehouse

- Similar to the hub-and-spoke architecture except there are no dependent data marts
- Contains atomic-level data, some summarized data, and logical dimensional view of the data
- Queries and applications access data



In, independent data architecture is not a formally advocated architecture in the industry. Nevertheless, data marts exists and used in organization as a DW solution. Hub and spoke architecture are widely used and developed in iterative manner, subject area by subject area.

Bill Inmon and Ralph Kimball, who are pioneers in the field of DW, Inmon is favour of a hub-and spoke architecture whereas the data mart bus architecture with confirmed Kimball. Kimball's approach, everyone is allowed to fabricate their database as per their own

requirements which is bottom-up approach where structure is easy to build. Inmon's approach is top-down approach.

5 LITERATURE REVIEW

In the literature review, "A survey on parallel and distributed data warehouse" by Pedro Furtado, Universidade Coimbra, Portugal describes basic query processing functionality.

$$\sum x = \sum_{\text{all nodes}} \sum_{\text{over node } i} (x)$$

In 2005, Watson and Ariyachandra [2] conducted a Web based survey of 454 for success of the various architectures to better understand the factors that influence the selection of a DW architecture and the. Bill Inmon and Ralph Kimball, who are leading experts in the field of DW, were among the participants. The results showed hub-and-spoke architecture (39%) followed by the bus architecture (26%), centralized (17%), IDM (12%), and federated (4%). In 2010, Ariyachandra and Watson [5] conducted another study in order to investigate the factors which influence the selection of a particular DW architecture, or more specifically, the research questions, "What factors are most important to the architecture selection decision?" and "What factors influence the selection of a particular architecture?" The results, which are based on responses from 400 organizations and interviews with experts, suggested that various combinations of organizational factors influence data warehouse architecture selection.

6 RESEARCH METHODOLOGY

Based on the literature and input from the experts, a variety of success metrics were identified. The data warehouse implementation and its architecture has different factors for the analysis of architecture.

1. Information quality
2. Organization impact.
3. System quality.
4. Individual impact.

- **Information Quality**

Information quality is an important factor to determine data warehouse architecture. In information quality, information must be accurate, information must be complete. Queries and reports should contain few errors because of data problems. Real-world objects and events should be correctly described.

- **Organizational Impacts**

Data warehouse should have positive impacts on the organization. It should satisfy the business requirements for which it was built, facilitate the use of business intelligence, support the accomplishment of strategic business objectives, and enable improvements in business processes.

- **System Quality**

System quality includes three measures – system flexibility, system scalability, and system integration. Data warehouses should be flexible. It should be easy to add new business processes and subject areas. The warehouses should be able to adapt to new requirements quickly. They should be able to easily support future application needs.

- **Individual Impacts**

By itself, a data warehouse does not create value. Value creation occurs when users employ the warehouse in their work. Users should be able to quickly and easily access data. They should be

able to think about, ask questions, and explore issues in ways that were not previously possible. Overall, the warehouse should improve users' decision-making capabilities.

6.1 Data Mining Applications

In this section, we have focused some of the applications of data mining and its techniques are analysed respectively Order.

6.2 Data Mining Application in Bank

Different banking sectors are widely used data warehouse and data mining technique. Now-a-days, banks are performing huge number of transaction concurrently. To identify customer needs and promote insurance service and loan service, they used data mining tools.

6.3 Data Mining Applications in Hospital

Data mining applications in health centre can have tremendous potential and usefulness [15]. However, the success of hospital data mining hinges on the availability of clean healthcare data. In this respect, it is critical that the healthcare industry look into how data can be better captured, stored, prepared and mined. Possible directions include the standardization of clinical vocabulary and the sharing of data across organizations to enhance the benefits of healthcare data mining applications

6.4 Future Directions of Health care system through Data Mining Tools

As healthcare data are not limited to just quantitative data (e.g., doctor's notes or clinical records), it is necessary to also explore the use of text mining to expand the scope and nature of what healthcare data mining can currently do. This is specially used to mixed all the data and then mining the text. It is also useful to look into how images (e.g., MRI scans) can be brought into healthcare data mining applications. It is noted that progress has been made in these areas.

The data mining is used an emerging trends in the education system [11, 12] in the whole world

In Indian culture most of the parents are uneducated .The main aim of in Indian government is the quality education not for quantity. But the day by day the education systems are changed and in the 21st century a huge number of universalities are established by the order of UGC. As the Numbers of universities are established side by side, each and every day a millennium of students are enrolls across the country. With huge number of higher education aspirants, we believe that data mining technology can help bridging knowledge gap in higher educational systems. The hidden patterns, associations, and anomalies that are discovered by data mining techniques from educational data can improve decision making processes in higher educational systems. This improvement can bring advantages such as maximizing educational system efficiency, decreasing student's drop-out rate, and increasing student's promotion rate, increasing student's retention rate in, increasing student's transition rate, increasing educational improvement ratio, increasing student's success, increasing student's learning outcome, and reducing the cost of system processes. In this current era we are using the KDD and the data mining tools for extracting the knowledge this knowledge can be used for improving the quality of education .The decisions tree classification is used in this type of applications.

6.5 Data mining is used for marketing analysis

Data mining technique is used in market demand Analysis).When the customer want to buying some products then this technique helps us finding the associations between different items that the customer put in their shopping buckets. Here the discovery of such associations that promotes the business technique .In this way the retailers uses the data mining technique so that

they can identify that which customers intension (buying the different pattern).In this way this technique is used for profits of the business and also helps to purchase the related items.

7 CASE STUDY

Our research work based on case study of data of e-governance of govt of Jharkhand. State wide area network is established by Jhar Net . They had automate many department, govt offices as well as CSC (common service centre). E-Nibandhan-automation of registration office all over the state. Jharkhand govt web portal, file traker, MIS for monitoring and evaluation for sarva shiksha abhiyan, web based software for the planning department ,computerization of social welfare department. Govt of Jharkhand has own data centre at JAP IT.

The Department of Information Technology, Govt. of India, as a part of NeGP (National e-Governance Program) has three components of SWAN, State Data Center (SDC) and CSC (Common Service Center). As a part of the CSC Scheme of Govt. of India, which aims at establishing 100,000 centers throughout the country, the Jharkhand State department of IT, plans to set-up around 4500 Common Service Centres (CSC) throughout all the panchayats in the State to provide e-government services and other value added services.

The CSC scheme seeks to transform rural India through the use of Information and communication technologies and delivery of a host of government and private services to the people living in rural areas at their doorstep. The services envisaged include e-government services, education, health and tele-medicine, financial, entertainment and others.

The Department of Information Technology (DIT), Government of Jharkhand (GoJ) designated Jharkhand Agency for Promotion of IT (JAP-IT) as the nodal agency for the implementation of the Common Service Center (CSC) Scheme in the State of Jharkhand. JAP-IT would facilitate the implementation as well as provide policy, G2C services, and revenue support to the SCAs. IL&FS is the National level Consultant and NLSA (National Level Service Agency) for the CSC Scheme.

The CSC Scheme is to be implemented on a public-private partnership (Build own operate-BOO) model wherein the private entity is selected to participate as a Service Centre Agency (SCA) responsible for developing and managing effective and sustainable business model. The DIT, Govt. of India would provide financial support to SCA through JAP-IT, in the form of revenue support sought as direct fund transfer and through additional central assistance (ACA). There is no financial commitment from the State government for implementing this Scheme. The MGNREGA soft is running fully online based e-goverence project by MoRD, GoI where they have data centre is centrally located at NIC HQ , New Delhi that connect 24 districts of jharkhand , 265 blocks , 4500 gram panchayats. Everyday huge numbers of data is stored through MGNREGA Soft. MGNREGA Soft project is running over the country from 2005. It store huge amount of data in a day. Now-a-days, like jharkhand many states are fully online which is best example of data ware house.

8 ANALYSIS & RESULT

In response to the question to which architecture is most suitable to survey at Jharkhand govt's department

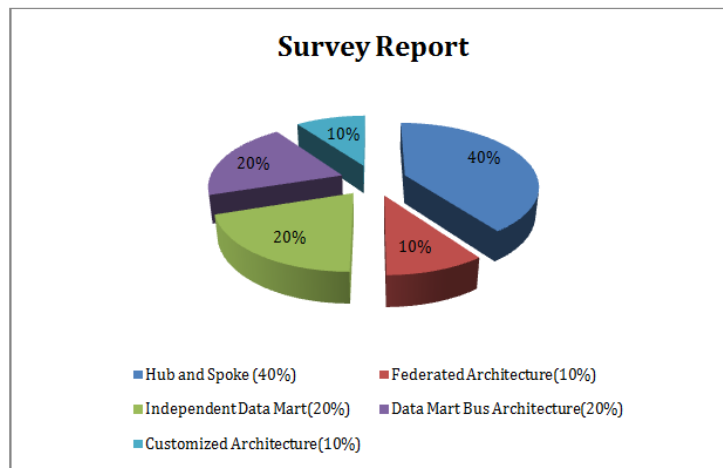


Fig. 3 Survey report with DW

9 CONCLUSION

The idea presented in this paper are based on comparative study of survey of data warehouse architecture and its application in data mining. Hence the analysis of the study of architecture of DW is not completed, it is in primary stage.

REFERENCES

1. A. Sen, A. P. Sinha, "A Comparison of Data Warehousing Methodologies Using a common set of attributes to determine which methodology to use in a particular data warehousing project", Communications of the ACM, March 2005, Vol. 48, No. 3 pp. 79-84.
2. H. J. Watson., T. Ariyachandra, "Data Warehouse Architectures: Factors in the Selection Decision and the Success of the Architectures", Terry College of Business, University of Georgia, (July 2005) http://www.terry.uga.edu/~hwatson/DW_Architecture_Report.pdf accessed 1.03.2012.
3. T. Ariyachandra, H. J. Watson., "Which Data Warehouse Architecture Is Most Successful?", Business Intelligence Journal Vol. 11, No. 1 2006 pp. 4-6.
4. T. Ariyachandra, H. J. Watson, "Which Data Warehouse Architecture Best?" Communications of the ACM October 2008, Vol. 51 No. 10 PP. 146-147.
5. T. Ariyachandra, H. J. Watson, "Key organizational factors in data warehouse architecture selection", Decision Support Systems 49 (2010)
6. Comparison of the Performance of Several Data Mining Methods for Bad Debt Recovery in the Healthcare Industry." the Journal of Applied Business Research, 21(2), 37-53. Zurada, J., and Lonial, S., 2005,
7. Chye Koh, H., Chin Tan, W., and Peng Goh, C., 2006, "A Two-step Method to Construct Credit Scoring Models with Data Mining Techniques." Journal of Business and Information, 1, 96-118.
8. Kirkos, E., Spathis, C., and Manolopoulos., Y., 2007, "Data Mining techniques for the detection of fraudulent financial statements." Expert Systems with Applications 32(4), 995-1003.
9. Atish P, S., and Huimin, Z., 2008, "Incorporating domain knowledge into data mining classifiers: An application in indirect lending." Decision Support Systems 46(1), 287-299.
10. "The comparisons of data mining techniques for the predictive accuracy of probability of default of credit card clients." Expert Systems with Applications 36(2), 2473-2480.
11. Robert P. Schumaker, Osama K. Solieman, Hsinchun Chen, Springer.
12. Educational Data Mining: An Emerging Trends in Education, International Journal of Advanced Research in Computer Science, ISSN NO- 0976-5697.
13. A comparative Study for Predicting Student's performance , Surjeet Kumar Yadav, Brijesh Bharadwaj2, Saurabh Pal3, International Journal of Innovative technology and creative engineering (ISSN:2045-711) VOL.1 NO.12 DECEMBER 2011.
14. J. A. Harding, M. Shahbaz, Srinivas, A. Kusiak Journal of Manufacturing Science and Engineering NOVEMBER 2006, Vol. 128 / 969 [15] HIAN CHYE KOH, School of Business, SIM University, Singapore.

#####

गांधीजी व्यक्तित्व और नेतृत्व : एक समीक्षा

डॉ. अंजू सोनकर

सहायक प्रोफेसर – गृह विज्ञान, लालता सिंह राजकीय महिला स्नातकोत्तर
महाविद्यालय अदलहाट, मिर्जापुर, उत्तर प्रदेश

व्यक्ति के सामाजिक राजनीतिक दर्शन पर उसके व्यक्तित्व तथा नेतृत्व शैली का भी प्रभाव पड़ता है। प्लेटों, अरस्तु या कार्लमार्क्स के दर्शन की अनेक मान्यताएं उनके व्यक्तिगत अनुभवों में खोजी जा सकती है। गांधीजी भी इसनियम के अपवाद नहीं थे।

आश्चर्य जनक व्यक्तित्व :

गांधीजी के सामाजिक और राजनीतिक दर्शन को समझने की पहली शर्त यह है कि पाठक उनके आश्चर्यजनक व्यक्तित्व और करिश्माई राजनीतिक नेतृत्व के बारे में कुछ जानकारी प्राप्त कर ले। गांधीजी क्षिति, जल, पावक, गगन, समीरा, जैसे पंच तत्वों से निर्मित मानव-शरीर मात्र नहीं थे। वे मूर्तिमती आत्मा-महात्मा थे। वे मनुष्य के रूप में वे अपने आपको अच्छाई और बुराई दोनों का सम्मिश्रण मानते थे। वे सत्य के शोधक थे और भगवान के दरबार में अपने आपको एक दीन, हीन, अकिंचन याचक समझते थे जिसके जीवन की चरम अभिलाषा देह के बंधन से छुटकारा पाना था लेकिन जो अपनी मुक्ति के लिए हिमालय की गुफा में बैठकर समाधि लगाना पसंद नहीं करता था बल्कि ईश्वर की सृष्टि की सेवा में, संसार के शोषित, दलित, तिरस्कृत, परित्यक्त व्यक्तियों की सेवा में अपने आपको खपाने के लिए आतुर रहता था। गांधीजी जैसा व्यक्ति इतिहास में शायद ही कोई हुआ से और भविष्य में भी शायद ही कोई हो सके।

गांधीजी के व्यक्तित्व की तुलना भली प्रकार से काटे गए हीरे के उस टुकड़े से की जा सकती है जिसके अनेक पहलू होते हैं और जिसके हर पहलू में आंखों में चकाचौंध पैदा करने वाली चमक होती है। गांधीजी ने जो कुछ भी कहा किया या लिखा, वह अपने आप में विस्मयजनक है लेकिन गांधीजी का व्यक्तित्व इन सबसे विस्मयजनक था। राजनीतिज्ञ, संगठनकर्ता, लोक नेता और नैतिक उन्नायक के रूप में महान होते हुए भी गांधीजी मनुष्य के नाते सबसे महत्तर थे। अपने कट्टर से कट्टर विरोधी को भी गले से लगाना उनकी निजी विशेषता थी। संसार में कोई उनका शत्रु था ही नहीं।

एक असाधारण विरोधाभास

जवाहरलाल नेहरू ने गांधीजी को 'एक असाधारण विरोधाभास' कहा है। नेहरू का यह कहना काफी हद तक सही भी है। सच तो यह है कि संसार के सभी महान व्यक्तियों के चरित्र में कुछ न कुछ विरोधाभास पाया जाते हैं इसका कारण यह है कि जीवन में स्वं हीसत्-असत्, शुभ-अशुभ, दिन-रात, प्रकाश-अंधकार, धूप-छांह, उत्थान-पतन का अद्भुत साथ दिखाई पड़ता है। यह विरोधाभास स्वयं जीवन क लिए आवश्यक हैं गोस्वामी तुलसीदास ने कहा है।

जचेना गुनदोषमय, विस्व कीन्ह करतार।
संतहंस गुन गहहिं पय, परिहरि बारि बकार।।

ईश्वर ने संसार को जड़-चेतन और गुण-दोष से परिपूर्ण बनाया है। संत हंस की भांति होते हैं। जिस प्रकार हंस दूध और पानीके मिश्रण में से दूध को ग्रहण कर लेते हैं और दोषों का त्याग कर देते हैं व्यक्ति की महत्ता इसी बात में है। कि वह विरोधाभासों के बीच संतुलन, समन्वय और सामंजस्य का संधान कर ले। भगवान-श्रीकृष्ण के गीता-दर्शन की लोकप्रियता का एक कारण यह है कि उन्होंने अपने समय की समस्त साधना-पद्धतियों के बीच समानता के सूत्र खोज निकाले। गांधी जी में भी विरोधाभासों के बीच सामंजस्य खोज लेने की अद्भुत क्षमता थी।

गांधी जी का जीवन सतत विकासशील था। वे एक बेहद शर्मिले, डरपोक और विषयासक्त इंसान से ऊपर उठे कि विश्वंघ्र महात्मा बन गए। उन्होंने अपने समस्त कार्यक्रम परिस्थितियों को देखते हुए निर्धारित किए थे। गांधी जी अच्छी तरह समझते थे कि जीवन में अनेक उलझने हैं। वह एक ऐसी रेल नहीं है जो एक बार चलने के बाद साधी दौड़ती चली जाए। उनके शब्दों में, “जीवन बहुत-सी शक्तियों द्वारा संचालित होता है। यदि कोई व्यक्ति किसी एक सामान्य सिद्धान्त के अनुसार अपना रास्ता चुन ले तो कोई कठिनाई न हो। लेकिन, मुझे एक भी ऐसा कार्य याद नहीं पड़ता जो इतनी आसानी से निर्धारित हो गया हो”

गांधी जी के जीवन में पाए जाने वाले विरोधाभासों की ओर इशारा करते हुए कुछ आलोचकों ने कहा है कि गांधी जी एक ओर तो रेलों, मशीनों और वर्तमान सभ्यता के उपकरणों के विरुद्ध थे और दूसरी ओर वे इनका प्रयोग भी करते थे इस बारे में गांधी जी के अपने विचारों का विश्लेषण रोचक होगा।

एक साक्षात्कार के दौरान गांधी जी ने चर्खे की ओर इशारा करते हुए कहा था, “यह कहना गलत है कि मेरा मशीनों में विश्वास नहीं है। चर्खा सुन्दर मशीन है।” असल में गांधी जी हर मीशन और हर भौतिक सुख-सुविधा की इस कसौटी पर परख करते थे। कि उससे जीवन का कितना हित या अहित हो रहा है। उन्होंने कहा था, “मैं सादी मशीनें चाहता हूँ। मैं ऐसे राक्षस नहीं चाहता जिन्हें कोई अपने पास न रख सके। मेरे लिए तो आदर्श मशीन वह है जिसे हर कोई रख सके। मेरी नजर में सबसे ज्यादा महत्व इंसान का है। जो चीज आम आदमी के लिए ठीक है। वह गांधी के लिए ठीक है जो चीज आम आदमी के लिए ठीक नहीं है, गांधी के लिए भी ठीक नहीं हैं।”

श्री रामचन्द्रन ने एक बार गांधी जी से पूछा था, “जब आप सीने की मशीन को अपनाने के लिए तैयार हैं तब आपको बाइसकिल और मोटर कार को भी अपनाना होगा।”

बापू ने जवाब दिया जवाब दिया था, “नहीं, उन्हें अपनाने की कोई आवश्यकता नहीं है क्योंकि उनसे मनुष्य की कोई बुनियादी जरूरत पूरी नहीं होती। मनुष्य की यह कोई बुनियादी जरूरत नहीं है कि वह मोटर कार की तेज रफ्तार से यात्रा करे। लेकिन सुई जीवन में एक जरूरी चीज है। वह एक प्राथमिक आवश्यकता है।”

प्रश्नाकर्ता ने गांधी जी से दो-टूक प्रश्न किया था, “आप यंत्रों के सर्वथा विरुद्ध हैं न?” गांधी जी ने इस प्रश्न का जो उत्तर दिया, वह एक ऐतिहासिक

दस्तावेज है और उसे दरिद्रता के निवारण का एक मौलिक समाधान माना जा सकता है। गांधी ने इस प्रश्न का निम्न उत्तर दिया था।

“कैसे हो सकता हूँ? जब मैं समझता हूँ कि मेरा शरीर ही एक बड़ा नाजुक यंत्र है तब यंत्रों के खिलाफ होकर मैं कहां रह सकता हूँ?...मेरा विरोध यंत्रों के संबंध में फैले दीवानेपन के साथ है, यंत्रों के साथ नहीं। परिश्रम का बचाव करने वाले यंत्रों के संबंध में लोगों का जो दीवानापन है उसी से मेरा विरोध है। परिश्रम की बचत इस हद तक की जाती है कि हजारों को, आखिर, भूखों मरना पड़ता है, और उन्हें बदन ढकने तक को कुद नहीं मिलता। मुझे भी समय और परिश्रम का बचाव अवश्य करा है, लेकिन वह मुट्ठी भर आदिमियों के लिए, बल्कि समस्त मानव जाति के लिए।

संत और क्रान्तिकारी

आर्थर कोएस्टिलर ने अपने ग्रंथ द योगी एण्ड द कमीसार में लिखा है कि मानव सभ्यता का भविष्य मानव-मन के पुनर्गठन पर निर्भर है “आज की परिस्थिति में न तो संत ही हमारी रक्षा कर सकता है और ही क्रान्तिकारी दोनों के समन्वय में विश्व का कल्याण है गांधी जी के श्रेष्ठ प्रतीक थे। वे संत भी थे और क्रान्तिकारी भी। संत के रूप में उनकी तुलना कृष्ण, बुद्ध और ईसा से की जाती है। क्रान्तिकारी के रूप में वे वाशिंगटन, मेजिनी और लेनिन के बराबर ठहरते हैं। गांधी जी संत और क्रान्तिकारी रूपों के समन्वय की सृष्टि हैं। उन्होंने आध्यात्मिक और ऐहिक का सुंदर मेल मिलाया और दोनों का एक साथ निर्वाह किया। अर्नेस्ट बार्कर ने गांधी जी के समन्वयशील व्यक्तित्व के बारे में यह ठीक ही लिखा है, “मैंने उनमें से संत फ्रांसिस को पाया जिसने समस्त विश्व के साथ सामंजस्य और विश्व की सारी वस्तुओं के साथ प्रेम का अनुभव करते हुए गरीबी की सादी जिन्दगी बिताने की प्रतिज्ञा कर रखी थी। मैंने उनमें संत टामस एक्वीनास को भी पाया जो संसार का एक महान् विचारकर और दार्शनिक हो गया है और जो बड़ी-बड़ी दलीलें देने में समर्थ था तथा सारे तर्क जाल से परिचित था। इन दोनों के अलावा मैंने उनमें एक व्यावहारिक मनुष्य को भी पाया जिसके पास अपनी व्यावहारिकता को मजबूत बनाने के लिए कानून की शिक्षा थी और जो अपने सत्परामर्श से लोगों का पथ-प्रदर्शन करने के लिए पहाड़ की चोटी से उतर कर चोटी से घाटी में भी उतर कर आ सकता था।”

धर्मप्राण राजनीतिज्ञ

महात्मा गांधी स्वभाव से धर्मनिष्ठ व्यक्ति थे। उन्हें राजनीतिज्ञ तो आवश्यकता के कारण बनना पड़ा। उनका राजनीतिक नेतृत्व उस विशाल प्रसाद की तरह था जिसकी नींव धर्म पर टिकी हो। राजनीतिज्ञ आम तौर पर धर्म की गहराई में नहीं जाते। राजनीतिज्ञों का मुख्य लक्ष्य रहता है सत्ता का अर्जन और फिर उसका रक्षण। सत्ताका अर्जन करने और उसे अपने हाथों में बनाए रखने के लिए राजनीतिज्ञों को प्रायः छल-कपट जैसे अनैतिक उपायों का आश्रय लेना पड़ता है जिनका धर्म से कोई संबंध नहीं होता। सच पूछा जाए तो ये उपाय धर्म के विरोध में होते हैं महात्मा गांधी इस नियम के अपवाद थे। उनके लिए सम्पूर्ण जीवन एक

इकाई था। धर्म, अर्थ, समाज, शिक्षा, राजनीति, विश्वशांति सभी एक दूसरे से जुड़े थे। उन्होंने स्वयं कहा था।

“जिसे सत्य को सर्वव्यापक विश्व भावना का साक्षात्कार करना हो, उसे संसार के छोटे से प्राणी को अपना ही समझ कर गले लगाना चाहिए। जिस व्यक्ति की ऐसी महत्वाकांक्षा हो, वह जिंदगी के किसी भी दायरे से अपने, आपको जुदा नहीं रख सकता। यही कारण है कि सत्य का पुजारी होने के कारण मुझे राजनीति में आना पड़ा है। मैं बिना किसी संकोच के और पूर्ण नम्रता के साथ कह सकता हूँ कि जो लोग यह मानते हैं कि धर्म का राजनीति से कोई नहीं है, वे नहीं जानते कि धर्म का अर्थ क्या है।”

एक अन्य स्थल पर धर्म और राजनीति के परस्पर संबंध को स्पष्ट करते हुए गांधी जी ने लिखा था।

“मुझे संसार के नश्वर वैभव की चाह नहीं है। मैं तो स्वर्ग के साम्राज्य अर्थात् आध्यात्मिक मुक्ति के लिए प्रयत्न कर रहा हूँ..... मेरे देशभक्ति भी अनंत शांति और स्वतंत्रता के देश की ओर मेरी यात्रा का एक पड़ाव—मात्र है। इससे स्पष्ट है कि मेरे लिए धर्म से रहित राजनीति की कोई सत्ता नहीं है। राजनीति धर्म का साधन—मात्र है। धर्मा रहित राजनीति मृत्यु का जाल है क्योंकि उससे आत्मा का हनन होता है।”

आदर्श और यथार्थ

संसार न केवल आदर्श है और न केवल यथार्थ वह आदर्श भी है और यथार्थ भी। कहना चाहिए वह दोनों का समन्वय है। गांधी जी का चिन्तन और जीवन आदर्श और यथार्थ की गंगा—जमुना का संगम था। वे कवि शैली की उस चिड़िया (स्काईलार्क) की भांति नहीं थे जो पृथ्वी पर स्थित अपने नीड़ की सुध—बुध भूल कर अनंत आकाश में पर फैलाए उड़ती है। वे कवि वर्डस्वर्थ की उस चिड़िया की भांति थे जिसे आकाश में उड़ते समय भी पृथ्वी पर स्थित अपने नीड़ की बराबर याद बनी रहती है। उनकी राय थी कि आदर्शवाद को यथार्थ का रूप धारण करने के लिए व्यावहारिक होना आवश्यक है। वे भावात्मक सत्य को उस समय तक बिल्कुल व्यर्थ मानते थे जब तक कि वह व्यक्तियों के जीवन में प्रकट न हो। हिंसा और कायरता के बीच चुनाव की स्थिति में गांधी जी का मत हिंसा के पक्ष में था। जीवन में थोड़ी—बहुत हिंसा है ही। इसलिए हमें गांधी की सम्मति में न्यूनतम हिंसा का मार्ग चुनना है। आचार्य जे.बी. कृपलानी ने गांधी जी के व्यावहारिक आदर्शवाद की पुष्टि करते हुए कहा है, “महात्मा गांधी इस बात को भली—भांति जानते थे कि कब दृढ़ रहा जाए और कब झुका जाए, कब और किन बातों में सहयोग किया जाए और किनमें असहयोग, कब प्रहार किया जाए और कब चुपचाप रहा जाए, कभी—कभी वर्षों तक।”

प्रवीण सेनापति

गांधी जी ने बीसवीं सदी के दो बड़े जन—आंदोलनों का नेतृत्व किया था—दक्षिण अफ्रीका में और भारत में ये दोनों ही जन—आंदोलन अपने ढंग के निराल थे। दोनों स्थानों पर उन्होंने निहत्थी और सदियों से शोषित जनता को संगठित किया और

आत्म-बल से संचालित सत्याग्रह द्वारा विरोधी शासन-सत्ताओं को घुटने टेकने के लिए विवश किया।

गांधी जी ने प्रायः 55 वर्ष तक सार्वजनिक क्षेत्र में काम किया। इस तूफानी संघर्ष में उन्हें अनेक संकटों और उतार-चढ़ावों का सामना करना पड़ा। उन्होंने इस बात को भली प्रकार प्रमाणित कर दिया कि वे स्वतंत्रता-संग्राम के कुशल सेनापति हैं। चतुर सेनापति से आशा की जाती है कि वह लड़ाई की प्रत्येक स्थिति को अच्छी तरह समझे और उसके अनुसार ही आचरण करे। सेनापति का एक भी गलत कदम समूचे राष्ट्र की तबाही का कारण बन सकता है। भारत के स्वतंत्रता आंदोलन के मुखिया होने के नाते गांधी जी सफल सेनापति-पद की कसौटी पर पूरी तरह खरे उतरते हैं।

क्रांतिकारी :

गांधी जी इतिहासके सबसे बड़े क्रांतिकारियों में से हैं। क्रांति का असली अर्थ व्यापक पैमाने पर खून-खराबा नहीं है। इतिहास में जो भी हिंसक क्रांतियाँ हुई हैं, फ्रांस की क्रांति के बाद नैपोलियन का उदय हुआ जिसने 20 साल तक यूरोप में लड़ाई के शोले भड़काए रखे। रूस के 1917 की बोल्शेविक क्रांति के बाद साम्यवादी दल की तानाशाही उभरी। यह तानाशाहों के हाथों में केन्द्रित हुई है। फ्रांस की क्रांति के बाद नैपोलियन का उदय हुआ जिसने 20 साल तक यूरोप में लड़ाई के शोले भड़काए रखे। रूस के 1917 की बोल्शेविक क्रांति का सूत्रपात किया, वह अधिकांश में अहिंसक क्रांति थी। यद्यपि भारतीयों को पाकिस्तान के रूप में आजादी की भारी कीमत चुकानी पड़ी फिर भी आजाद भारत लोकतंत्र और विकास के रास्ते पर चला है। गांधी जी ने भारत के सामने कुछ नैतिक आदर्श रखे थे। यद्यपि इन नैतिक आदर्शों का पूरी तरह पालन नहीं हुआ है, फिर भी वे भारतीय अंतश्चेतना के सामने दिए की भांति टिमटिमाते रहते हैं।

विश्वशांति का मार्ग :

गांधी जी ने अपने सत्य और अहिंसा के प्रयोग भारत की धरती पर किए। यह उनके स्वदेशी सिद्धान्त का परिणाम था। चूंकि भारत ने गांधी जी को जन्म दिया था, अतः भारत का गांधीजी पर पहला अधिकार था। गांधी जी भारतीय सभ्यता और संस्कृति के भी प्रशंसक थे और उसे अपने अहिंसात्मक प्रयोगों के अनुकूल मानते थे।

लेकिन गांधी जी का सिद्धान्त सिर्फ भारत के लिए नहीं था। वे ऐसे भारत के स्वप्नदृष्टा थे जो सारे संसार के लिए हितकारी हो, जो संसार की सेवा में ध्वसावशेषों पर उन्नति करें।

महात्मा गांधी ने अपने सारे आंदोलन सत्य, अहिंसा तथा नैतिक सिद्धान्तों के आधार पर संचालित किए थे। उनका विश्वास था कि यदि उनके सिद्धान्तों ने भारत में अपनी उपयोगिता सिद्ध कर दी तो संसार के अन्य देश की भी उन्हें अपना सकते हैं।

गांधी जी की देशभक्ति को ऐकांतिक वस्तु नहीं थी। वह सर्व-व्यापिनी थी। वे उस देशभक्ति का त्याग करनेके लिए प्रस्तुत थे 'जो दूसरे राष्ट्रों को आफत में डालकर, उन्हें लूटकर बड़प्पन पाना चाहती है। वे केवल मानव-प्राणियों से ही

भाई-चारे का संबंध स्थापित करना नहीं चाहते थे बल्कि प्राणिमात्र से एकता का संबंध जोड़ना और उसका अनुभव करना चाहते थे।

गांधी जी पश्चिमी जनतंत्र के आलोचक थे। उनके विचार से इसमें “जनतंत्र के नमूने के कुछ कीटाणु व तत्व अवश्य हैं मगर वह सच्चे अर्थों में जनतंत्र तभी हो सकता है जब हिंसा रहित हो जाएगा और इसमें से बदअमली और खुराफात अदृश्य हो जाएंगे।”

भारतीय संस्कृति के प्रति अपनी अटूट आस्था के कारण गांधी जी कहा करते थे कि अगर भारत तलवार के सिद्धान्त को अपनाता है तो उसे क्षाणिक विजय प्राप्त हो सकती है, पर तब भारत मेरे हृदय का गौरव न रह जाएगा। भारत के प्रति गांधी जी की भक्ति इसलिए थी उन्होंने भारत से बहुत कुछ पाया था। उन्हें पक्का विश्वास था कि भारत को ‘दुनिया के लिये एक संदेश देना है।’

गांधी जी का धर्म भौगोलिक सीमाओं से बंधा हुआ नहीं था उन्होंने का था, “जिस दिन भारत तलवार के सिद्धान्त को ग्रहण करेगा, वह मेरी परीक्षा का दिन होगा और मुझे आशा है मैं अपने कर्तव्य में हल्का न उतरूंगा... अगर मुझे इसमें जीवित श्रद्धा होगी, तो वह मेरे भारत-प्रेम को भी पार कर जाएगी।”।

गांधी जी एक-दूसरे पर निर्भर मित्रतापूर्ण राष्ट्रों के विश्वसंघ के समर्थक थे। उनके सत्याग्रह का सिद्धान्त केवल भारत के लिए न होकर सारे संसार के लिए है।

सन्दर्भ

1. रोमांरोलां, महात्मागांधी जीवन और दर्शन। पृष्ठ 172
2. मो० क० गांधी, हिन्दस्वराज। पृष्ठ 23
3. हरिजन, 12 दिसम्बर 1938। पृष्ठ 326-27
4. प्यारे लाल पूर्ण हुति, चतुर्थ खण्ड। पृष्ठ 41
5. Waalikhana, Facts and Facts, Vikash Pub. House, Delhi पृष्ठ 139
6. गांधी की आत्मकथा, 1948। पृष्ठ 6-7
7. रोमांरोलां, महात्मागांधी जीवन और दर्शन अनु० पी० सी० ओझा, लोकभारती प्रकाशन, इलहाबाद, पृष्ठ 142
8. कलेक्टेड वर्क्स ऑफ महात्मा गांधी (नई दिल्ली पब्लिकेशन्स डिविजन, भारत सरकार), ग्रंथ। पृष्ठ 219

#####

SEMANTIC CLOUD: A LANGUAGE REPOSITORY USING WORD SENSE EMBEDDING

Dr. Shreya N. Patankar

Department of Computer Engineering, K J Somaiya Institute of Engineering and Information Technology

Abstract - Semantic information from any word in the context is integral to the task of word sense disambiguation (WSD) as it helps to achieve performance enhancement for various Natural language processing tasks (NLP). Extraction of such semantic information is crucial for any NLP task like machine translation (MT), Question Answering (QA), Information Retrieval (IR), etc. In this paper, we use the existing approach of the Continuous Bag of Words (CBOW) model to generate word sense embeddings for various languages including Indian regional languages and foreign languages. The languages used for the evaluation of word sense embeddings are English, Swedish, French, German, Hindi, and Marathi. To evaluate the embeddings model, we test the system for manually created corpus for the English language, and the same is translated using Google translate in other above-mentioned languages. We hope this approach proves helpful for the addition of more languages, especially resource-constrained Indian languages, and boost the NLP task.

Keywords: word embeddings, sense, context, natural language processing, sense disambiguation.

1. INTRODUCTION

Large amounts of text needs are very much in demand on a daily basis and this takes the research in the direction of Natural language processing. Text processing is a tedious task as language is ambiguous and the accuracy of the system depends on the way the ambiguity is handled in context. Ambiguity handling will enhance the accuracy of the system and this is done using WSD. A tremendous amount of work is done in the English language and the results achieved are satisfactory but there are various languages that are not explored and very little research is reported on Indian languages and low-resource languages. Correct Semantic information is important and crucial in any word and this is achieved by resolving the ambiguity in the text. Word sense embeddings play an important role in the representation of semantic information and are found useful in various NLP as data is represented as dense features in a vector space which highlights semantically similar information coming closer in this space. These embeddings are helpful as they help in resolving the ambiguity and make the task simpler and extraction of such semantic information will help in various NLP applications like MT, IR, QA, etc. Non-availability of corpus and dictionaries for various languages makes the generation of embeddings difficult as raw corpus is required for creation of embeddings in the training process unlike the traditional machine learning models which requires supervised data for training. Lack of resources and insufficient data has made the creation of embeddings difficult and manual creation of corpus takes ample amount of time and is a costly process. Hence knowledge from external sources needs to be provided to boost the accuracy of current WSD systems but these external sources like Wikipedia itself lacks data in low resources languages.

Making use of knowledge-based systems is not sufficient enough for the growth of WSD systems and although dictionaries in multiple languages are available, relying on these resources may not generate satisfactory accuracy as various problems needs to be resolved like the identification of proper nouns from the dictionary and unknown words not being part of the dictionary. Data needs to be trained to create embeddings that can generate strong semantic information which helps in representing a bag of words closer in the vector space. This is achieved using the continuous bag of words (CBOW) model which takes as input a bag of words and represents the information in vector form and keeps the semantically similar information related to a particular word close so that related information to the word helps resolve the ambiguity.

Word and sense embeddings create a semantic cloud termed a language repository for a few languages and we create an open framework for representing of word sense embeddings in various languages. As the framework is open it can be adapted across various languages. As the corpora for languages in concern is not available, we make use of English language corpora and translate it into other languages like Marathi, Hindi, Swedish, French and German thereby making a repository of embeddings that will be used for resolving of ambiguity. Various embedding techniques are available like fast text, glove termed as global vectors, CBOW and skip-gram model. We make use of CBOW model as we aim to resolve ambiguity and for lexical sample task and CBOW is most suitable for such tasks.

2. OBJECTIVES

The research aims to focus on preparation of a language repository for low-resource languages and this is achieved using the CBOW model. It also aims to provide an open framework for adaptation of various other languages so that the framework can be widely explored to prepare repositories for various languages. Major objective of the research is focused on resolving the ambiguity from the words in the context and this is achieved using creation of sense embeddings. Major contribution of this paper is focused on preparation of repository for Indian languages and foreign languages and representing the embeddings as semantic cloud as a collection of repositories of various languages. This repository will be used not just for resolving ambiguity but also can be used to boost various NLP tasks.

3. RELATED WORK

Work on embedding creation was carried out by Mikalov and he created two models of CBOW and skip gram models.[1] The model was able to create word embeddings in a vector space and brought semantically similar words close in vector space. This model was one of the widely used models for the creation for word embeddings and various researchers used this model for the creation of embeddings by training the corpus and the results achieved were satisfactory. A WSD survey paper highlights the contribution and motivation for ambiguity resolution by providing task description. [2-4] Various researchers experimented with multilingual WSD by using Wikidumps and Wikipedia data as external knowledge helps boost the accuracy of sense disambiguation task. Multilingual dictionary like Babelnet was also used to make the accurate sense disambiguation and good precision and recall was observed. Task such as word spell correction and more complex tasks have shown significant improvements by making use of embedding model. Neural networks model has also shown very good accuracy and has inspired various languages model to train embeddings for sense disambiguation task.[5-6] Research is also reported on cross lingual sense embeddings creation which helps extract cross lingual information retrieval process. As embeddings advent into the world of technology, there arise a need for creating word sense embeddings models for various languages and represent them as a semantic repository cloud. This paper creates embeddings for a few languages and provides an open framework for addition of more languages to form a cloud of language repositories.

4. METHODOLOGY

The major contribution of this paper is the generation of the English language corpus and converting it into other languages for the creation of embeddings so that it is used for further processing and it also includes Wikipedia data for training. The corpus is then made use of to create word sense embedding and these embeddings are represented as a semantic cloud of various language repositories. The created corpora is not domain specific and we have kept it as a general domain corpus so that further research on the corpus is not a tedious task. The corpus is pre-processed by cleaning and then the paragraphs in the corpus are divided into sentences and sentences into words and all the stop words such as question marks, comma full stop, and special characters are removed in the pre-processing steps. Pre-processing also includes

performing tokenization, stemming and lemmatization followed by parts of speech tag attachment which results in pre-processed data.

The research contributes by creating word sense embedding to improve the accuracy of the system and input is fed to the system using natural languages and we make use of CBOW model to generate word embeddings is focused on effectively resolving WSD and improving the accuracy of the system. The WSD system takes input in the form of natural language and our research uses English, Marathi, Hindi, Swedish, German and French languages. Monolingual or multilingual dictionary resource alone doesn't help in resolving the ambiguity of the text as context words and target words if drifted apart may result in varied score, so there a rises a need to provide world knowledge to the system. Hence a strong urge to create embeddings which bring related words to close. There exists a dependency between related words in the context which system fails to understand and this can be best explained using word embeddings. The embeddings generate a matrix which represents values and words which are similar in context or frequently used in the context carry similar values and this helps the system to understand that words are semantically similar. The following figure 1 depicts the representation of words in CBOW model.

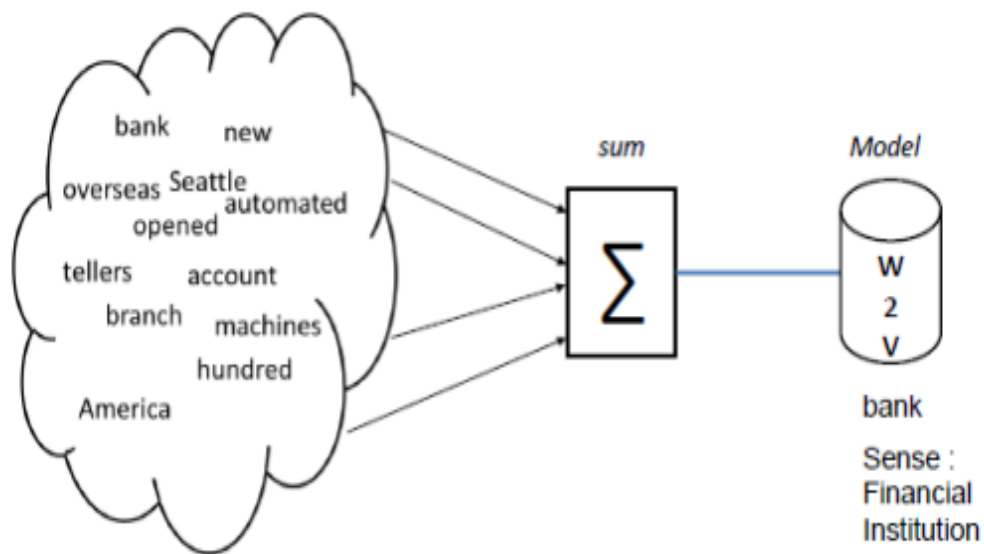


Figure 1 Word representation using CBOW

For example, to prepare a vector for the word bank, we feed the system with the corpus of sentences related to the word bank. The words that appear in close proximity of bank or in context with bank are [interest, annum, loan, amount, money, saving. etc]. These words along with the ambiguous words are given to the CBOW model which generates an embedding of the sense bag bank that has values closely similar appearing in the context. The following figure 2 demonstrates the creation of the vector process.

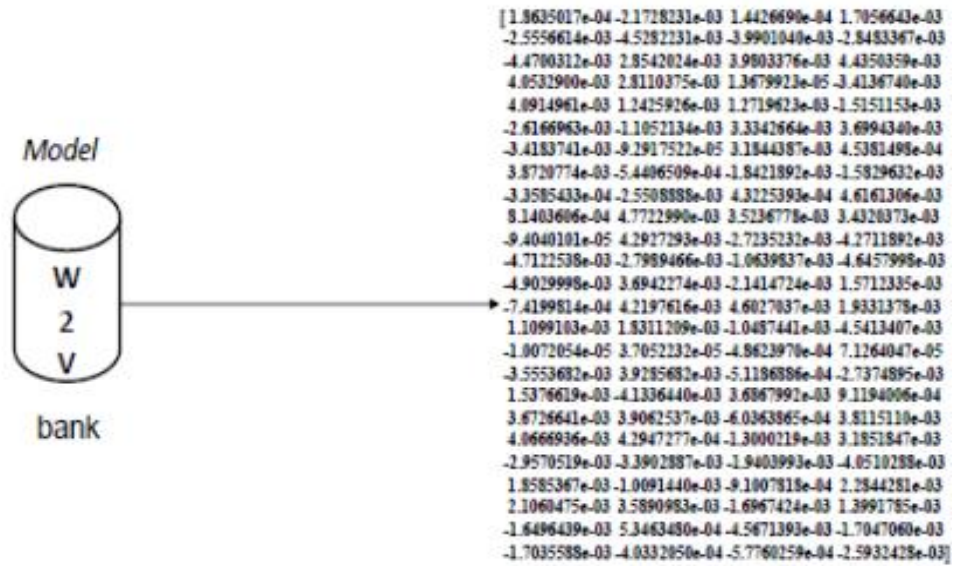


Figure 2 Vector representation using CBOW

We create such embeddings for 6 languages and create a repository of sense embeddings as represented in the figure 3 below.

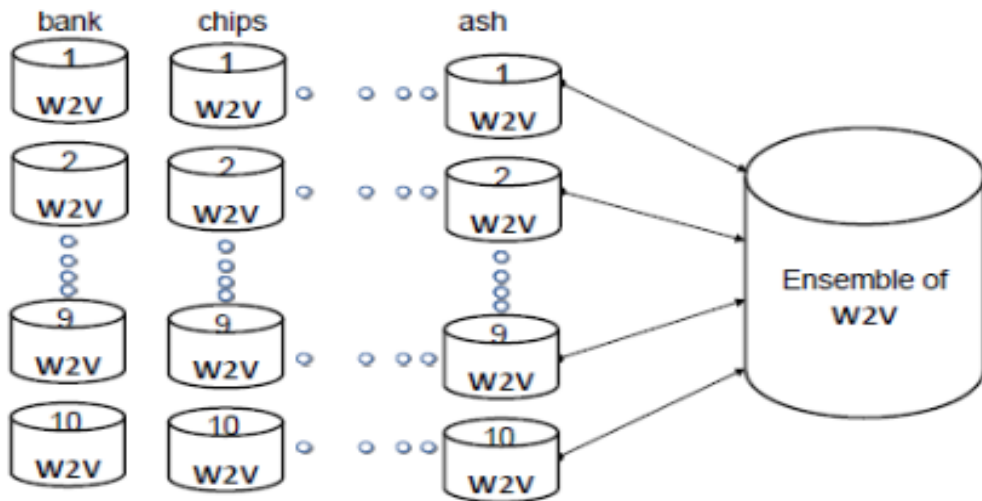


Figure 3 Word repository

5. RESULTS AND DISCUSSION

The system is tested for 6 languages including English. Training and testing include a ratio of 70 and 30 and the precision and recall is calculated and F1 score is generated based on precision and recall and is presented below in Table1.

Table I Word Embeddings

Languages	F1 Score
English	59.88
Marathi	60.5
Hindi	52.34
German	55.2
Swedish	54.8
French	57

It is observed that the accuracy is reaching a level of satisfaction but still needs to be improved. The embeddings have a drawback in that more the data more powerful embeddings

are generated at the cost of training. This needs to be improved. The repository of embeddings is created to generate a sense bag of language repository which helps strengthen the task of Natural Language processing.

6. CONCLUSION

A repository of word sense embeddings is created for six languages for manually created corpus and the accuracy observed is satisfactory which can be improved by adding more data to the training set. The ambiguities are removed from the text using these embeddings effectively and the framework is open for the addition of more languages to the system. This will be beneficial for low-resource languages which are explored and the research benefits society by exploration of such low-resource languages.

REFERENCES

1. Mikolov T., Kai C., Greg C., Jeffery, D.; "Efficient Estimation of Word representations in vector space", In Proceedings of workshop at ICLR, 2013.
2. Chen X., Liu Z., Sun M.; "A unified model for word sense representation and disambiguation", Proceedings of the 2014 conference on empirical methods in natural language processing (EMNLP) Qatar, 2014, pp. 1025-1035.
3. Navigli R.; "Word sense disambiguation : A survey", ACM computing surveys, Vol. 34, No. 2, Article 10, 2009.
4. Navigli R., Ponzotto P.; "Multilingual WSD with just a few lines of code: the Babelnet API", Proceedings of the 50th Annual meeting of the Association for Computational Linguistics, Korea, 2012, pp. 67-72.
5. Montoyo A., Romero R., Vazquez S., Calle C., Soler S.; "The role of WSD for Multilingual natural language applications", International conference on Text, Speech and Dialogue, Springer, 2002, pp. 41-48.
6. Fu R. Guo J., Qin B., Che W., Wang H., Liu T.; "Learning semantic hierarchies: A continuous vector space approach." IEEE Transactions on Audio, Speech, and Language Processing 23.3, 2015 pp. 461-471.

#####

20TH CENTURY RENOWNED NOVELISTS AND THEIR CHOSEN THEMES – AN EXPLORATION

Dr. Joghee Senthilkumar

Assistant Professor of English, Department of English language & Literature,
Faculty of Social Science and Humanities, Gambella University, Ethiopia, East-Africa

Abstract - There appeared many historical novels such as Padmini of T. Ramakrishnan in English in 1903; His novel narrates the story of Talaikotte Battle, that 'never to be forgotten; Vijayanagara Empire. Romesh Chandra Dutt's *'The Slave Girl of Agra'* (1909) and Sir Jogendra Singh's *'Nurjahan'* (1909) are also historical romances. Manohar Malgonkar's *'Distant Drum'* and *'A Bend in the Ganges'* explore more about the two nation theory. Following these historical novels, there appeared many novels about social criticism and social protest of a distinctive group. Certain other novels tell about the racial marriage, culture of various regions and differences in languages etc.

Keywords: criticism, distinctive group, racial marriage, regions, historical novels and social protest.

INTRODUCTION

The novels written in modern times, Tagore's *'The Home and the World'* and *'Four Chapters'* say about politics and revolutionary movements of the twentieth century. *'The Sword and the Sickle'* of the Mulk Raj Anand and *K.A. Abba's Ingulab* both commented about the politics of the twenties. *'Kandan the Patriot'* of K.S., Venkataramani (1932) and *Kanthapura (1938)* of Raja Rao were certain best novels in the early thirties. There were innumerable miseries and frustrations in the novels of N.S. Phadke's *'Leaves in the August Wind'* (English version of his own Marathi novel), Bhattacharya's *'So many Hungers'* (1947), R.K. Narayan's *'Waiting for the Mahatma'*, (1955) and Kamala Markandaya's , *Some Inner Fury*, (1957) filled with partisan of art, in Kushwant Singh's *'Train to Pakistan'* (1956), Balachandra Rajan's *'The Dark Dancer'* (1959). We come across glimpses of horror during the partition period.

A Literary Appreciation of Great Leaders

Father of our Nation Gandhi too exercised a potent influence on our language and literature through his own writing in English and Gujarathi. His autobiography, *'The Story of my Experiment with Truth'* is an imperishable classic. When Gandhi was tired or exhausted Dr. Sri. Raja Gopalachari assisted him in writing of autobiography into English.

Jawaharlal Nehru our Nation's eminent leader and great politician is identified as a superb writer in English. He has an amazing and idiomatic style in his writings. His autobiography and his, *'Discovery of India'* are great masterpieces of his own. Whatever he sketches, it has an architectural fineness and perfection. "He was like a powerful current of fresh and that made us stretch ourselves and take deep breaths; like a beam of light that pierced the darkness and removed the scales from our eyes; like a whirlwind that upset many things but most of all the working of peoples mind," observes Nehru about Gandhi.

Living Novelists

The latest list of top 10 Indian Writers in English today has been published recently. After a brief check out the following list of authors and their books are listed out as the Top 19 Indian Writers in English today.

Salman Rushdie

The 1980s and 1990s saw a renaissance of Indian writing in English, making the task of choosing the top TEN authors of this genre especially, challenging. The renaissance was spearheaded by Salman Rushdie. He wrote a path breaking novel, *'Midnight Children'* in 1980. It was a grand

success to him to have written such an unbeaten creation. Following this there has been a great of Indian authors writing in English. These contemporary writers emerged from various corners of India. Earlier writers like Nirad. C. Chaudhuri, R.K. Narayan, Malkuraj Anand or Raja Rao used English in its classical form. Salman Rushdie gave importance to multiculturalism in his novels with his Pidgin English and a new trend in writing, '*Midnight children*', '*Shame*', '*The Moor's Last Sign*', '*Fury and Shalimar*', '*the Clown*' were certain other novels he wrote during 1980s. His '*The Satanic Verses*' was full of his most controversies with the usage of magic realism. He was accused of blasphemy by many Muslims because of certain allegedly irrelevant references to islam Prophet Mohammed, in 1989, Ayotollah Khomeini of Iran issued a fatwa calling for the execution of the author, Rushdie. Many countries banned the book including India. Rushdie flew to U.K. in order to escape from the fury and punishment of the Khomeini Government. To this day Rushdie is being chased for execution of the fatwa.

Vikram Seth

Vikram Seth stands second in the series who produced some magnificent works like *The Golden Gate*, '*A Suitable Boy*', '*An Equal Music*' and '*Two lives*'. A Suitable Boy, his second novel based in a post independent India, brought him into the limelight.

Arundati Roy

Arundati Roy made a radical change with her commercial success in writing in having written her, '*The God of Small Things*'. It revealed the talent of Indian authors and brought her the Booker Prize and remained on the top of the New York Times best seller list for a long time. There started the trend of large advances no heard of until then among Indian writers.

Rohinton Mistry

The rest of the authors to be discussed, in the coming list are, Rohinton Mistry, V.S. Naipaul, Amitav Ghosh, Jhumpa Lahiri, Shashi Tharoor and Upamanya Chatterjee. The author displayed the issue of affecting the Parsi Community in India. Although the novels are very long and make the readers tired of depression, the lyrical prose in them enchanted the readers. Some of her better known works include, '*Such a Long Journey*', '*Family Matters*' and '*A Fine Balance*'.

V.S. Naipaul

V.S. Naipaul is of Indian origin, though he was born in Trinidad and was a Nobel Laureate. He was a prolific writer. His critical and scornful commentaries on the developing countries like India or the Caribbean and his evaluation and assessment of Muslim fundamentalism on non-Arab countries have become a subject of harsh criticism. V.S. Naipaul's works include '*A House for Mr. Biswas*', '*India*', '*A Wounded Civilization*', '*An Area of Darkness*' India '*A million Mutinies Now*' and '*A Bend in The River*'.

Amitav Ghosh

Among the top ten contemporaries Amitav Ghosh is an author's respected name who has won many accolades including Sahitya Akademic Award and the Prix Medici's, Etrangere of France. He produced the most lyrical and insightful works on the effect of colonialism on the native people. His books were '*The Circle of Reason*', '*The Glass Palace*', '*The Calcutta Chromosome*' and '*The Hungry Tide*'.

Jhumpa Lahiri

Jhumpa Lahiri is a recent entrant into the world of Indian Writers. His debut book, '*The Interpreter of Maladies*' stormed the literary world, which won him the prestigious Pulitzer prize in 2000. The '*Namesake*', his first novel is an ambitious attempt he made to sketch out the

lives of an immigrant family through the eyes of a young boy. Both the books received brickbats as well as accolades.

Shashi Tharoor

Shashi Tharoor's works include, The Great Indian Novel and Show Business. His latest book, '*India; From Midnight to Millennium*' is a non-fiction and is a chronicle of India's past and its further projection.

Upamanyu Chatterjee

Upamanyu Chatterjee is the last among top ten writers who deserves a mention. He was one of the first Indian authors who found success outside India with his debut novel, *English, August (1988)*. It is a witty and amusing book full of wry human portraying India.

Rabindranath Tagore

Rabindranath Tagore is an all round creative genius of our country. Tagore's poetry appears with such fineness and cohesion in form, matter and feeling. It is all his own. And yet he is rooted in the soil of his land. He had drunk deeper than anyone else, from the mainsprings of Indian poetry.

He is the most Indian of the Indian poets as well as the most universal. He was always open to receive from every quarter and from every source from English poetry to Bengali nursery rhyme, from the most elaborate classical symphony to the simplest rustic time. But whatever he received he made his own; he was incapable of imitation of any kind. He wrote poems with the ultimate source of creation and continuation of life in every form. His notation in writing poetry is universal from the Indian point of stance.

Tagore travelled all over the civilized world, and was received everywhere with warmth and spontaneous welcome. He was a quiet thinker at most times but he was capable of quick decision and prompt action when needed. Viswa Bharati and Santiniketan are the standing evidences for his power of organization and long-time planning. He produced his poetry by a very healthy mind housed in an uncommonly strong, healthy and handsome body.

In Tagore's early days he had no social contacts available to a boy from an ordinary middle-class home as he was the youngest of his mother's fourteenth issues, he heard stories of Rama, Mahabharata and recited versions from Meghaduta all told by his elder brothers. He had finished reading Bengali novels of Bankim Chandra Chatterji when he was a teen-ager.

The poet envisages a glorious image of India as a nation about to rise up from the stupor of ignorance and inactivity. Herein in these lines we can recall Vivekanda, the great youth prophet's call to the youth of our country by saying:

***"Arise, Awake and stop not until
Your goal is reached".***

Chetan Bhagat, the author of the select novels under study too delivers his address to the youth of India to be aware of things happening around him in connection with the corruption, education, secularism and rants. At the major problems of India and introduces the concept and the need for the common Indian values that India is lacking.

Chetan Bhagat tries to his best to mobilize youth through his writings as well as the social network. Besides many musical plays, tragic and comic dramas Rabindranath Tagore created many short stories in Bengali (1891) and remained the best. The sense of frustration in human life is tersely and exquisitely expressed by Tagore in his dramas. Tagore's stories are neat and perfect, and they can be compared favorably with the best in any language. His first two novels have their plots taken from the history of the seventeenth century Bengal, in 1883 and 1885. Some fifteen years later the next novel, *Cokher Bali (Eye-sore, 1902)* was written by Tagore. The psychosis of the characters is followed realistically, and this is unique for Indian literature.

Tagore wrote the great novel 'Gora' (1910) about the problems of the individual. It also narrates about the problems of the society and the state. Gora had been rightly viewed as a Mahabharata of Modern India. The social and political destiny of the country is boldly indicated and there is a clear prediction of the non-co-operation movement of Mahatma Gandhi. Ghare Baire (At Home and Outside, 1916) followed by Chaturanha (The Quarter 1916) was introduced in 1916.

Jogayog, Seser Kavitha (1929), Dui Bon (The two sisters, 1933) and Malanca. The Florist's Garden (1934) are long stories of Novelettes.

Char Adhyay (Four Chapters, 1934) was written in Ceylon. It is a novel no doubt, but in length, it is little more than a long story. There is an attempt here to analyze the real motives and values of the revolutionary activities of violence in Bengal that followed the non-co-operation movement and Tagore shows that however a patriotic or philanthropic motive there may be, it is never a man's duty to follow it if it goes against his conscience or good sense. Tagore's deep sympathy for the independence movement and his admiration for the young men and women, who sacrificed themselves for the cause of independence, have found glowing expression in this last novel of his. At the same time his acute insight and far-reaching vision have not missed the lurking pitfalls of a bloody revolution. That Tagore's analysis and assessment was essentially correct was proved inversely by the luke warm acceptance of the novel by the general apathy of the common readers when it was first published.

In spite of all the above poems, dramas, novels etc., Tagore wrote essays on religious matters, political issues and about his extensive travels in India and abroad. Tagore has also written innumerable letters with full of literary green and thoughtful content.

Rabindranath Tagore ranks with the greatest masters of the craft of writing stories. He brings the smallest details of life with the analysis of human relationships. K. Chandrasekharan feels that "Tagore's capacity for arresting descriptions, his highly cultivated sensitiveness to beauty and penetrating analysis of the relationship between human beings, have all brought us a wealth of felicity derivable from literature", Ibid.

Toru Dutt

With an impeccable feeling for words, Toru Dutt had remarkable gifts for poetic description, narration and dialogue. The poetry of Toru Dutt mirrors, to a certain extent, her own life. And as such some relevant biographical facts may lead us to a better understanding and appreciation of Toru Dutt's poetry.

Toru wrote two novels, one in English names, '*Bianca or the Young Spanish Maiden*' and another in French entitled, "*Journal de Mademoiselle Arvers*". A friend critic considers her a linguistic prodigy and remarks.

*"This one surpasses all the prodigies.
She is a French Women like
Ourselves. She thinks, she writes
Like one of us".*

Toru had a special liking for the story of Satyavan, Dhruva, Ekalava, Sindu, Hiranyakasipa and Prahlad. She listened to all these tales without any tiresome and rendered them into exquisite pieces of poetic excellence.

Mulkraj Anand

The Indian novelist, Mulkraj Anand is not usually attracted to new techniques in plotting, narration and characterization. As a rule, description of sex life used to be prudish, but writing in is less inhibited in novels published in recent years. Norms are changing in India too. The Indian novelists tried 'the stream of consciousness' the method of narration. One can find stern consistency in the novels of Mulk Raj Anand and R.K. Narayan. Anand hails from India while

Narayan from almost the Southern end of the Peninsula. Born at Peshawar in 1905, Mulk Raj Anand had his education in Lahore, London and Cambridge.

The first five novels of him appeared in the following sequence. *'Untouchable'* (1935), *'Coolie'* (1936), *'Two Leaves and a Bud'* (1937), *'The Village'* (1939) and *'Across the Black Water'* (1940). Therefore, however, several novels and collections of short stories: *'The Sword and the Sickle'*, *'The Barber's Trade Union'*, *'The Big Heart'*, *'The Tractor and the Corn Goddess'*, *'Seven Summers'*, *'Private Life of an Indian Prince'*, and *'Morning face'*.

Anand's first three novels were banned by the Indian Government. The names of these novels appeared like so many packets of dynamite: They ruffled the bureaucracy. One of them, *'Two Leaves and a Bud'*, had to be withdrawn from circulation in England on the threat of prosecution as an obscene book.

Of all the novels, *Untouchable* is most compact and artistically satisfying, *Coolie* is the most extensive in space and time, evoking variegated action and multiplicity in characters, while *Two Leaves and a Bud* is the most effective as a piece of implied indictment.

Untouchable is further, the shortest of the novels, and the most revealing and rewarding of the lot. *Untouchable* covers the events of a single day in the life of the 'low caste' boy, Bakha, in the town of Bulashah. Anand is the most competitive writer with nearly three dozen books to his credit. All his major novels reveal his basic concern for the down-trodden and his relentless zeal for social justice. Anand deals with the misery and wretchedness of the poor and their struggle for a better life. He showed eagerness to raise the position of the untouchables, the peasants, the serfs, the coolies and the other suppressed members of the society, to human dignity and self-awareness in view of their untold sufferings, despair and apathy they were put into.

Prof. Mehta says:

"Dr. Anand, in all his novels emphasizes the fact that nobility and dignity is not the monopoly of the rich. The poor have their greatness, honour as well as the rich. Mute inglorious Miltons and Cromwell's are not uncommon in the ranks of the poor"

R.K. Narayan as a Novelist

R.K. Narayan is a novelist and an ardent writer of the middle class. Narayan sets his stories on the traditional Malgudi. He has dealt with the town Malgudi and its surroundings in all his works and short stories.

His novels may be classified as early novels, domestic novels-dealing with Mammon-worshippers and political novels. His early novels-*'Swami and Friends'*, *'Bachelor of Arts'* and *'The English Teacher'*- although of slender structure and plot show signs of his future brilliance.

'Swami and Friends' has for its background a town called Malgudi lying on the border of the states of Mysore and Madras. Malgudi is for Narayan what Weymouth had been for Hardy. All his novels are set in Malgudi. There are river Sarayu, Nallappa's Mango Grove and the Memphis Forest. There are also numerous streets and lanes like Kabeer Street, Kabeer lane, Sarayustreet, Smith street, Vinayaka Temple, Mudali Street, etc., Later there are some improvements like the Lawley Extension. The Albert Mission School has become Albert Mission College from which the hero of 'Bachelor of Arts' graduates and in which the hero of 'The English Teacher' delivers his lectures on English Literature.

Narayan's novel *'The Dark Room'* is a study of domestic disharmony. It deals with the tragedy of domestic life. The hero of this novel is Ramani, a successful branch manager of

Insurance Company. He has a middle aged wife namely, Savirti and three children namely, Babu, Kamala and Sumathi. The early chapters are devoted to his life and moods. Later a lady named Shanta Bai is taken as an Insurance Organiser for improving business and he soon falls in love with her. Rumours get widespread. Savithri's life becomes highly miserable and she attempts to commit suicide. But she is saved by a blacksmith, returns home and takes up her normal duties as a housewife.

'The Financial Expert' of Narayan's novel based on the town of Malgudi is a precious book, full of hidden humours. The story deals with a middle aged money lender, Margayya. Dr. Pal, a 'Journalist, correspondent and author' and Margayya's son Balu whose progress from charming childhood to spoil, frustrated manhood all contribute to the saddest episodes. Margayya the sad, ambitious, absurd financial expert is perhaps the most engaging of all Narayan's characters.

Narayan's next novel, *'Mr. Sampath'* is most unusual and its way a minor masterpiece. *'The Guide'* which won for Narayan the SahityaAcademi Award shows the novelist's skill in placing the Orient into fashion for Occidental eyes. The hilarious charming and typical novel, *'The Man-eater of Malgudi'* of Narayan is delightfully funny and deeply thoughtful.

The novel, *'Waiting for the Mahatma'* of Narayan has a special significance of its own. Here the author has encompassed a wider theme and handled it with great artistry. Narayan's latest novel *'The Vendor of Sweets'* also has the usual freshness and vigour, but it deals with a theme unlike that of his previous novels. The clash of affections is nicely depicted. Thus in all his novels, as Dr. Iyengar feels,

*"Narayan presents smiles and tears
together, smiling through the tears
In things and glimpsing the rainbow
Magnificence of life"*

Raja Rao as a Novelist

Raja Rao is hailing from Mysore from an old and learned Brahmin family. Raja Rao's first novel, *'Kanthapura'* appeared in 1938. A volume entitled, *'The Cow and the Barricades'* containing the collection of short stories, was published in 1946. Raja Rao's *'The Serpent and the Rope'* was published in 1960. His next novel *'The Cat and Shakespeare'* appeared in 1965. He is a versatile writer in three languages Kannad, French and English. He won Sahitya Academi Award and was honoured with the title of 'Padma Bhushan' by the government of India in 1969.

Women Novelists

Shashi, Anita Desai, Kamala Markandeya and Shashi Deshpande were other women novelists of Indian writers in English.

Kamala Markandeya as a Novelist

There are several outstanding writers of no mean wisdom who have compelled world attention. Even more than men, women writers, gifted with extraordinary talents have made Indo-English Literature a matter of interest evinced by the publishers as well as readers.

Kamala Markandeya is the most outstanding Indo-Anglian novelist and has about six novels to her credit. She follows a unique narrative technique and structure in her novels. Her *'Nectar in Sieve'* is the most widely read and has been a compulsory study in Asian studies and in American Universities. Her *'Some Inner Fury'* is a superb success and had made Markandeya a major fiction writer. *'A Silence of Desire'* is her third novel. It is the most ambitious novel which bridges the chasm between matter and spirit, doubt and faith.

Markandeya's *'Some Inner Fury'* is a superb success and made the author a prolific writer that India has produced. Mira is a beautiful Hindu girl. Richard is an official of the British Government of India. They are worlds apart, yet they met and fell in love. This is their story.

This is a compelling novel of two young people whose love cut across the boundaries of hatred and survived the terrors of war. Markandeya's next novel '*Possession*' is a story narrated by Anusuya. Her novel, '*To Whom She Will*' is a vivid analysis in social observation; the social etiquette and manners are more specifically depicted in this novel.

The other novels of her, '*Get Ready for the Battle*', '*From Fear Set Free*', '*A Time to be Happy*', and her latest novel, 'Storm in Chandigarh' deal with social atmosphere of the modern world and with the realities of the situation and makes a sincere exposure of the events of life.

Anita Desai

Anita Desai occupies a distinguished place among the Indo-Anglian Writers, whose maiden novel; '*Cry the Peacock*' put her in the front rank of contemporary novelist. Her '*Voices in the City*' is also much acclaimed. Her latest novel is '*Bye-By-, Black Bird*'. She has added a new dimension to the achievement of Indian women writers in English fiction. She deals with the exploration of sensibility rather than outer world of action.

Anita Desai is a reputed Indo-Anglian woman novelist. She is known for her distinctive style and intensely individual imagery. In her first novel, '*Cry the Peacock*', the narrator is a hyper sensitive young woman, tense and over wrought. The main pattern of the contrast between the woman's response to the world through her senses, and her husband's response through his intellect. '*Cry the Peacock*' of Anita Desai is a typical 'feminine' novel, a novel of sensibility rather than of action. It's concern is almost wholly with the terrors of existence.

Besides all the above there were many other postcolonial reputed authors like Bhabani Bhattachariya, Amitabh Ghosh, Shashi Tharoor, Raj Kamal Jha, Jhumpa Lahiri, Shobha De, Manju Kapur, Anita Nair to name but a few aiming at encouraging variegated opinions, without confirming to fixed and rigorous critical canons they have focused on novels, but also on the other forms of literature that are brilliant evocation of historical, psychological and subliminal issues.

Amitab Ghosh

Amitab Ghosh is one of the foremost Indian diasporic writers in modern Indian English writing who believes in what Ahmad has said. His reputation rests on '*The Circle of Reason*' (1986), '*The Shadow Lines*' (1988) '*Quotations found*' (1992), '*The Calcutta Chromosome*;' '*A novel on Fevers, Delirium and Discovery*' (1996), '*The Glass Palace*' (2000), the nonfiction. The Glass Palace won the 2001 Frankfurt e-book Award of fifty thousand dollars Grand Prize for non-fiction. He has presented a unique rendition of history in fiction from the international perspective and writes imaginatively about the process of colonization in India, Burma and Malaya.

The novel opens with the distant noise of the 'English Canon' outside the royal palace called the "*Glass Palace*" is Mandalay where a coal-black" in Mandalay where a coal-black Kaala Rajkumar, the eleven year old Indian orphan from Bengal, is serving in Ma Cho's tea-stall. The Burmese King Thebaw and the piquant queen Supayalat, the royal prisoners, are deported into exile in Ratnagiri in Maharashtra and the palace itself is on the brink of defeat after the declaration of King The baw's "*Royal Proclamation*".

His majesty, who is watchful that the interest of our religion and our state shall not suffer, will himself march forth will efface these heretics and conquer and Amax their country. To uphold the religion, to uphold the national honour, to uphold the country's interests will bring about threefold good-good of our religion, good of our master and good of ourselves and will gain for us the important result of placing us on the path to the celestial regions and to Nirvana(16).

Jhumpa Lahiri

Jhumpa Lahiri pioneered the venture of a collection of short stories entitled Interpreter of Maladies and was named by New Yorker as "One of the 20 best writers under the age of 20"

(www.saja.org). Like Edgar Allan Poe, Jhumpa adheres to the fineries of a short story to heighten the effect to the apogee she strives to achieve total effect through the process of brevity, perspicuity and verity of experience. "Lahiri is the kind of writer who makes you want to grab the next person you see and say, 'Read this!' She's a dazzling story teller wing a distractive voice, an eye for nuance, an ear for irony. She is one of the finest short story writers I've read", says Army Tan at the back cover of the text. Jhumpa's other stories are, '*Sexy Mrs. Sen*', '*This Blessed House*', '*The Treatment of Bibi Halder*' and a '*Temporary Matter*'.

A precarious balancing of two cultures, forging a path and forming a bridge are tight rope walking, migrant Indian English writers do. The new generations of Americans, born of Indian immigrant parents are presented by this young and vibrant writer. Her first novel, *The Namesake* published in 2003 and her collection of short stories, *Interpreter of Maladies*, published in 1999, which won the Pulitzer Prize for fiction 2000, made her a literary celebrity overnight. Lahiri, being the daughter of Bengali parents, her heritage and culture are influenced by India and the United States. This multicultural life style, with perplexing experiences of these bicultural worlds prominent in both her books.

Rajkamal Jha

'The Blue Bedspread' (1999), being the debut novel of Raj Kamal Jha, the novelist shot into literary fame with its publication. This novel bagged the prestigious commonwealth Prize for literature. His second novel, '*If you are Afraid of Heights*' (2003), published after a considerable gap, continued to maintain the standard that Jha, as a novelist, has set for himself. This novel presents the peculiarities of the landscape and life of Kolkata, a typical Indian city undergoing fast change to cope with the pace of development. It focuses the common and often neglected class of individuals, struggling to come to terms with their hopes and despair.

'If you are afraid of Heights', the second novel, is set in three parts, each part presenting a different story. Rima and Amir meet by chance in midnight during an accident and consequently acquainted each other, the messages of a news reporter Mala uncovering the incident of a girl child's rape and murder in a suburban town, the fears of a young girl shaken by suicides in her neighborhood, are the pivotal stories recounted in the three parts respectively. Even though placed independently the three stories are linked together in so far as these commonly constitute the body of the fictional world the novelist aims to project.

Siddharth Shanghvi

Siddharth Dhanvant Shanghvi's debut novel '*The Last Song of Dusk*' is one of the most recent voices that have made an instant mark in the literary scene. The kind of deep understanding into the realm of intricate human relationships, of love and loss, of darker or shady aspects of human characters that he exhibits and the deft style of writing make Shanghvi's work a true winner. No winner, the book has already won the first novel Betty Trask Award for him. Through the explorations of love and loss, sexuality and innocence friendship and solitude it is surely another great debut of India. In the exotic technique of Magic Realism, Shanghvi weaves the tale of the Gandaravas in a combination of humour, darkness and exuberance. *The Last Song of Dusk*, a song of dawn for Shanghvi – has already won wide acclaim in the literary circles. It has received rave reviews like this one from Book list.

Shashi Tharoor

Shashi Tharoor's '*Rio't*', published in 2001, is an interesting mixture of facts and fiction presented through various narrative modes. The plot of the fiction revolves around the death of Priscilla Hart, an American doctoral student working for an NGO in Zailgorh in Northern India. The book begins with a newspaper report informing us about a riot. The novel revisits the sight of the incident and reconstructs the circumstances surrounding the death. Along with the main thread of the story that resolves around the affair between Priscilla Hart and V. Lakshman, the Stephen's

educated District Magistrate, the narrative also includes perspective on the socio-cultural milieu and political traditions that influence and shape the environment of the Indian sentiment.

Tharoor, by simultaneously offering divisive and variant notions of the historical impetus, brings into sharp focus the limitations of historical knowledge that is at best seen as a creative discourse which “actively” survives with the nebulous notions of “truth” and “reality”. In other words, Riot characterizes historical narrations as inventions or fictions.

***“which have more in common with
Their counterparts in literature than
They have with those in the sciences”***

Here, in this novel, history is constructed as a fiction in which the uses of formal literary devices have been involved. To quote Hutcheon, both history and fiction,

***“are cultural sign system, (and)
Ideological construction” (292).***

Anita Nair

Anita Nair’s ventures have produced some good works and in a little span of her career she has gained an international reputation. Her first publication was *‘With Satya of the Subway’*, a collection of short stories. She has made news with two novels, *‘A Better Man’*, (2000) and *‘Ladies Coupe’* (2001). *‘Her Malabar Mind’* (2002) is her poetic sparks. Anita Nair has written a collection of writings on Kerela. Her latest book, Puffin Book of World Myth and Legends, which makes readers realize Nair’s concern for all classes and groups of people.

Anita Nair’s *‘Ladies Coupe’* is set in a railway compartment specially meant for ladies. Six ladies in the coupe narrate their stories and share their secrets lying deep in their hearts. The train journey, through various tunnels and wild vegetation, unfolds a backward journey, which the ladies undertake in their lives. The vivid realization of their roles separates from them their real selves. Their agitated minds and their longing bodies need heaven’s rain, which cannot only wash their complicit between their bodies and souls, the body finally wins since it is the body and bodily desires that dictate the soul.

Manjoo Kapur

A group of Indian Women novelists in their in betweenness, hybridity of thought and multi cultural, multi lingual and multi-religious social dimensions have contextualized the women problem in general and middle class and upper class women in particular. While the same language of Silence, that is spoken in practice in too many countries; Indian women novelists like Githa Hariharan, Shashi Deshpande, Arundati Roy and Manju Kapoor have tried with sincerity and honesty to deal with the physical, psychological and emotional stress syndrome of women.

Manjukapur’s novel, *‘A Married Woman’* is a work of investigative reporting of the most controversial and political issue of the demolition of Babri Masjid and a woman’s love and lesbianism. The novel is a kind of narrative on a woman’s incompatible marriage and resultant frustration and political turmoil in its historical context. In the novel, Kapur has taken writing as a protest, a way of mapping from the point of a woman’s experience. Kapur has proved through his woman protagonist that,

***“A woman should be aware, self controlled,
Strong willed, self reliant and rational,
Having faith in the inner strength of
Womanhood, A meaningful change
Can be brought only from within by
Being free in the deeper psychic sense”***

Astha, a sensitive daughter of an enlightened father and orthodox mother has grown in a middle-class educated house wife, teacher painter and a lesbian in her status of a married woman. She fights for her self assertions. Unlike many married girls she had her infatuations of

adolescent love for Bunty, a boy from another colony and for a better career. But her real story of love and marriage started with Hemant, the son of a successful government official in Delhi. Soon after marriage Astha gets disillusioned about human nature in general and politics of the country in particular. Sharing her feeling,

*"We should struggle with her, agonize
Together with about her choices, and
Weep with her once she's made them".*
Astha realizes herself that,
*"A willing body at night, a willing
Pair of hands and feet in the day
On an obedient mouth" (231)*

Are the essential prerequisites of a married woman? She contemplates marriage a terrible decision as it puts her in a lot to enjoy bouts of rage, pain and indecision.

CONCLUSION

Hence it is of more useful to the students of English Literature, researchers and even it would appeal to those interested in the English works of Indian Writers. It will undoubtedly enkindle in readers an avid interest towards their works and also help them sharpen their critical understanding and appreciation with its ample food for thought.

Nevertheless, it would be more appropriate to note that the readings of the novels and other literary works of the above authors have been many a leading lights to the later novelists like that of **Chetan Bhagat** of the present century, to have become a block buster novelist attracting millions of readers, to understand the 'Youth Icon' in the author and the Indian Youths, their cultural conflicts, his representation of his autobiography and the sportive spirit found in himself and his protagonists in his select novels of the 21st century.

WORK CITED

1. Bhattacharyya, Bharbani, **In Modern India: Indo-Anglian**. Ed. By. Iqbal Bhaktiyar.43
2. Ibid. 42
3. Channel, Nahal, '**Feminism in English Fiction**'
4. Ghosh, Amitav, '**The Glass Palace**', New Delhi: Ravi Dayal, 2000.
5. Iyengar, Srinivasa K.R., '**Indian Writing in English**'.
6. Joshi K.N and Shymala Rao. B. - '**Studies in Indo Anglian Literature**', BAREILLY. ISBN 81-85 897-70-0 reprint: 2006.
7. Kapoor, Manjoo, '**A Married Woman**', New Delhi, India Link, 2002. P.189.
8. Mongia, Padmini, '**Finding Our Self More or Less**'.
9. Mehta, '**Indo Anglian Fiction - An Assesment**' p.166.
10. Rao Raja. '**Kanthapura**' (preface) O. U.P. 1947.
11. Sengupta. S.C. '**The Great Sentinel**'. 179.
12. Singh, Susila, '**Forms and Variations**', Ed. (New Delhi : Prestige, 000) p.17.
13. Tharoor, **Shashi, 'Riot'**, New Delhi. Viking. 2001.
14. Whorf, '**Indian Writing Today**', Vol.8 (New Delhi - Editorial)

#####