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An Improved Grey Wolf Optimization Algorithm for Enhancing Two-Pass Opinion Mining Classifier using Patient Reviews

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Abstract--*The Sentiment analysis on various product reviews is a fascinating area of natural language processing and web text mining. Our Objective is to analyze the effect of an artificial neural network based method for drug based opinion classification. In the research that has done so far on sentiment analysis, ANNs have been considered rarely. In this work feed forward neural network architecture has been studied for sentiment classification. When back-propagation learning algorithms are used to train neural networks, they are typically slow and higher learning rates are needed. The selection of an appropriate learning rate is a complex issue. Proper learning rate is necessary to overcome the problem connected with back-propagation algorithms. More effort need to be put forth in the training of a neural network due to its nonlinear nature .Also identifying the unknown best set of main controlling parameters (weights) is a task where a quicker learning rate will cause unsteady learning. At the same time, a slower learning rate causes a disproportionately longer training time. It is quite demanding to discover an easy method for decide on the learning rate. Forgetting the optimal solution, Usually flawless weight connections are not formed by the back-propagation learning algorithm In this study, a Grey Wolf Optimizer algorithm was revised. For optimizing the weight of a neural network, this modified version was applied to the two pass opinion classifier.. When NN is weight optimized by IGWO, our Two Pass classifier is found to perform better and yields higher accuracy in classification. Accordingly, in my previous research, an efficient two-pass classifier system for patient opinion mining to analyze drugs satisfaction is proposed. Then, the selected features are given to optimal two-pass classifier. The two-pass classifier is a combination of support vector machine (SVM) and neural network (NN). Here, the weight value of (SVM-NN) classifier is optimally chosen with the help of improved gray wolf optimization (IGWO) algorithm. Finally, in the classification stage, we attain an opinion of corresponding drugs. The performance of proposed methodology is evaluated in terms of precision, recall and F-measure.*

Key words--*Opinion mining, drugs review, prediction, Two Pass Classifier, neural Network, SVM,, modified Grey wolf optimization, modified TF-IDF, Patient users, Pharmacy*

I. INTRODUCTION

Basically, number of drugs is manufactured by pharmacy companies which are available for each disease. Some, drugs cure the diseases immediately, some drugs take maximum time, some makes side effects and some are high dosage medicine.

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Among them, identifying the drug which majority of the patients are satisfied with based on patient's opinion is a challenging task. The Pharmacy company manufacturing the particular drug also can analyses which of the drug is having better opinions among its customers who are patients. To find the drug that the patient users are more satisfied with, a two pass Classifier based on SVM and NN to organize the product reviews into two group such as positive, negative was introduced. Drug reviews collected from the websiteaskapatient.com are used for valuation. In this research work, a new novel formula for the updation mechanism is devised for the Grey Wolf Optimizer algorithm. Then, the modified version of GWO was applied for optimizing the weight of the two pass opinion classifier's neural network. The resultant methodology, IGWO-SVMNN, is rigorously examined based on the data from drug reviews which includes a series of factors that influence the pharmacy companies.

II. LITERATURE SURVEY

Natural learning process (NLP) is a deposit of computational techniques used to examine natural language texts which allows computers and machines to recognize human communication. NLP deals with actual text element processing [1]. Opinion mining deals with following the client state of mind about a particular theme. This software mines opinions, perceptions, sentiments along with emotions in text automatically and also observes feelings and attitudes on the web [2]. People let others know about their opinions through comments, reviews, blog posts and tweets on a variety of topics. Tracking of a product or brand and determining if it is perceived positively or negatively can be performed utilizing web [3]. Opinion mining is a task under natural language processing for detecting the mood of the clients about a specific topic or product [4]. The opinion mining has a few different tasks and many names such as sentiment analysis, opinion extraction, subjectivity analysis, sentiment mining, emotion analysis, effect analysis and review mining. [5]. Opinion mining sets itself for retrieval of information and computational linguistics. Opinion mining collects and unites many concepts from various ideas and methods.. The language term is the primary unit of NLP [6].Depending on hidden Markov models (TextHMMs) that support text, Kang et al. [7] have presented a fresh sentiment analysis method to classify text that utilizes a word sequences in training texts as a replacement for predefined sentiment lexicon. Integral TextHMMs are used for calculating the sentiment orientation of sentences . Manochandarand and Punniyamoorthy [8] have explained a scaling feature selection and support vector machine based customer review classification. Selection of the minimum number of features to efficiently classify reviews is the main objective of this work. Here, they designed new TF-IDF and Glasgow expression for the reduction of the feature set size. The classification is done with the help of SVM. Rachana and Abhishek [9] have explained a TF-IDF based news recommendation system. News paper is essential for daily life. Here, BBC database is utilized for recommendation system. The TF-IDF and similarity matching algorithm mainly used for in this paper. Moreover, Harnani et al. [10] have proposed a Weighting Scheme for reviews on Movies. So as to deal with these issues, a new approach is presented. Here, the IF-IDF based approach is introduced for better performance.

Lot of researchers has analyzed opinion mining in drugs products. Among them some of the research works are analyzed here;Plaza-del-Arco*et al* [11],have presented the first Corpus Of Patient Opinions in Spanish (COPOS). The key methodologies in operation in the task of polarity classification were used to carry out experimentations and

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exhibit the helpfulness of the corpus. The all-purpose lexicon iSOL getting adapted with the health fieldis a very attention-grabbing study.

Erik Cambria *et al* [12], cognitive model derived from the collective use of multi-dimensional scaling and neural network is exploited for finer modeling of the way multi-word terms are structured in a brain-like creation of natural language concepts. They also demonstrated how such a human-like reasoning framework outperforms state-of-the-art clustering techniques for opinion mining. Moreover, Gopalakrishnan *et al* [13], have presented about the predictions made on the contentment level on drugs by patients who are knowledgeable about the effects of a drug. In this work, the authors have aimed to apply techniques based on Neural networks for mining opinion from the publicreviews in the domain of health care. The reviews of two different drugs have been extracted. Sabuj*et al* [14], have presented a Support Vector Machines (SVM) algorithm based opinion classifier which is also used to inspect data for classifying opinions. In this work, they have designed a classifier for verifying the opinions based on Bangla text data. Go, Alec*et al* [15], The mining of sentiments and emotions of tweets about Indian politicians using Support Vector Machine have been offered. The performance of the anticipated method is calculated based on accuracy, precision, recall, and f-measure on using Unigram and TF-IDF as feature extractors. Similarly, Charalampos Vassiliou*et al* [16], have presented an elegant and effective framework for mingling neural networks and collaborative filtering. In their approach,they have utilized neural network to make out hidden patterns among user profiles and other items of interest. Collaborative filtering is used additionally to improve the personalized suggestions. Additionally, Bijoyan Das and Sarit Chakraborty *et al* [17], have offered the model which is applied on three dissimilar text mining algorithms. They have recognized that the Linear Support vector machine (LSVM) is the most suitable one to work with their proposed model. There is a significant elevation in accuracy in the results obtained when compared to former methods. For training the MLP NNs (in most cases), optimized Back-Propagation (BP) [19] or standard algorithms [18] mainly categorized under supervised learning methods are applied. Gradient based BP algorithm has some shortcomings such as slower convergence rate, high probability of local optima entrapment, highly depends on the preliminary learning rate [20]. In [21], the Grey Wolf algorithm was used to teach a customary neural network taught that is used for sorting a sonar dataset. The study indicated that the GWO had a incredible capacity for solving advanced dimension issues. This tactic was considered against a set of optimization algorithms. The terms such as the convergence speed, the possibility of trapping in local minima and classification accuracy were used for assessment .The approach recommended here, accomplished well, in maximum tests, than the other approaches.

III. RESEARCH METHODOLOGY

Proposed Features Based Opinion Mining

Opinion mining focus on retrieving opinions of users about a service, product, and policy. Accordingly, in my previous work research, an efficient two-pass classifier system for patient opinion mining to analyze drugs satisfaction is proposed. To optimize the Neural network used in the two pass classifier ,in this paper a modified meta heuristic algorithm is proposed for weight optimization After the preprocessing, modified TF-IDF based feature is selected from the dataset with the help of java program. After that, based on the features, feature vector is

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generated. Then, the selected features are given to two-pass classifier. The two-pass classifier is a combination of support vector machine (SVM) and neural network (NN). Here, the weight value of (SVM-NN) classifier is optimally chosen with the help of modified gray wolf optimization (IGWO) algorithm. Finally, in the classification stage, we attain opinion of corresponding drugs. The evaluation metrics such as recall, precision and F-measure are used for measuring the execution of the proposed methodology.The overall concept of proposed methodology is given in figure 1.

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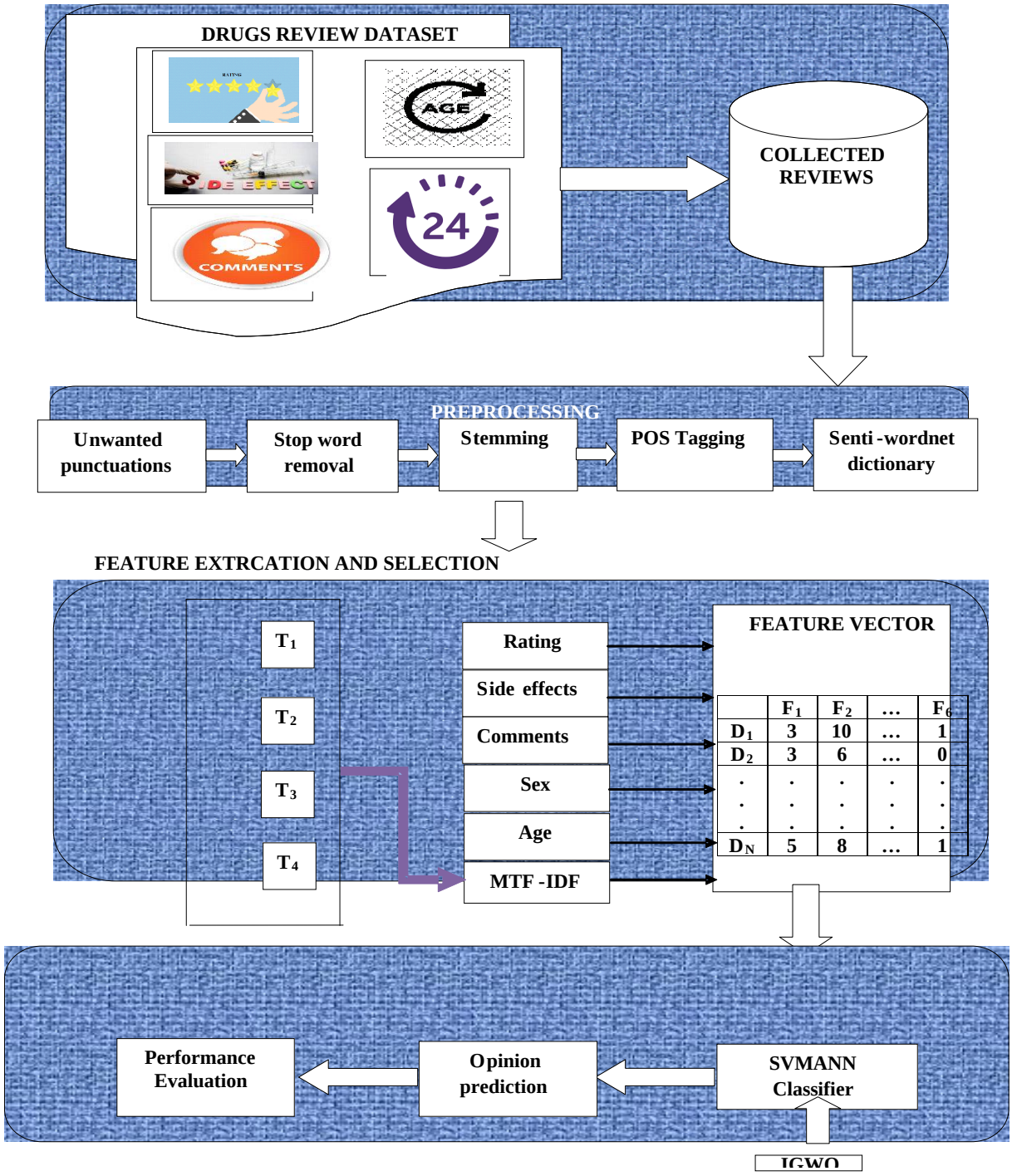

Figure 1: Overall diagram of proposed methodology

The proposed methodology consist of three phases namely, preprocessing with modified tf-idf feature selection, Modification of GWO, Apply the GWO to randomly adjust weights to sort the learning rate, classification with optimized classifier. Initially, the reviews are preprocessed using following stages namely, removal of unwanted punctuations, stop word removal, stemming, POS Tagging. After the preprocessing stage, a Modified TF-

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IDF based feature selection is done from the dataset.. Then, the selected features are used to generate a feature vector. After that, the selected features are given to the two pass SVMNN in order to predict the opinion for the given drug . In this SVMNN, the weight values are optimally chosen with the assistance of IGWO algorithm. Finally, the experimental results are analyzed in as per the measures such as precision, recall and F-Score.

Preprocessing

Preprocessing is an important process for opinion mining. Because the client reviews are not in same format, it will be numeric, non-numerical, string and redundant data. In order to calculate the decision of each opinion, the reviews are preprocessed. For preprocessing, in this paper five methods are utilized namely, unwanted punctuations removal, stop word removal, stemming, POS tagging and Senti Word Net. Consider the dataset D, which has n number of records and m number of features. Among the features, comment and side effect features are extracted from the dataset and store it into the individual text document. The preprocessing steps are explained below;

Unwanted punctuations: From the review, initially, unwanted punctuations are removed because all punctuations are not used for opinion prediction. Among the punctuations some are meaningless.

Stop word removal: In stop word removal process, some of the words are removed which are used more and more time in comment. Similarly, pronouns, conjunction, preposition have no particular meaning. So, these words also removed in this stage. Example of stop words: a, an, I, are, is, as, this, in, from, or, on, was, to, what, with, will.

Stemming: Stemming is a process which is used to transform a word into its original grammatical form. For example, it alters word like “teach”, “teacher”, “teaching”, “teached”, “teaches” to root word “teach”.

POS tagging: The mission of handing over suitable POS with every word in a sentence is known as Part of speech (POS) tagging. In this paper, Stanford tagger is utilized for labeling words. The tags typically assigned are of verb, adjective, noun and adverb category.

Senti Word Net dictionary: Senti Word Net dictionary estimates score for the tagged words and the score is set to feature vector generation process. The positive and negative score for each word is previously defined in the Senti Word Net dictionary. The tagged word is assigned with a weighted score .Using the weighted score the sentiment score is calculated.

Feature selection using Modified tf-idf

In this stage, the important feature is selected from dataset D. The dataset consist of seven features namely, rating, reason, side effects, comments sex, age duration and date added. Among the features, Rating, side effects, comments, sex and age are extracted using java. To improve the prediction accuracy, in this paper, additionally we added the TF-IDF based feature. Basically, we calculate the feature based on TF-IDF is given in equation (1).

$$TF - IDF = \frac{FR_{td}}{length_d} * \log\left(\frac{N}{n_j}\right) \quad (1)$$

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Where, TF is the frequency of a term in a document, IDF gives less significant weightage for high frequency terms, N represents the number of reviews present in the training process and n_j represent the number of occurrence of j^{th} word in the training reviews. In this case, words with frequency are only selected. The different words with same meanings are omitted. This will affect the accuracy of opinion mining. To triumph over the problem, new formula is developed in this paper which is based on four types of features. The modified TF-IDF based feature selection is given in figure 2

$$MTF - IDF = \sum_{i=1}^{n-1} \sum_{j=i+1}^{n} \left[\left(\frac{T_1(U_i U_j) + T_2(U_i U_j) + T_3(U_i U_j) + T_4(U_i U_j)}{4} \right) + \left(\frac{TF(U_i) + TF(MU_i)}{2} \right) \right]$$

Figure 2: Modified TF-IDF formula

Where, U_1 represent the user 1 reviewer comment, U_2 represent the user 2 reviewer comment, MU_1 represent the meaning of user 1 reviewer comment, MU_2 represent the meaning of user 2 reviewer comment and N represent the number of words in user 1.

After selecting the features, feature vector is generated. The size of the feature vector is $n \times m$.Here n represents the reviewers quantity whereas m represents selected features. A representation of the feature vector formed is shown in table 1 and feature vector matrix is specified in equation (2).

Table 1: Feature vector formation

Reviewers	**F_2 (side effects)**	**F_3 (comments)**	**F_1 (Rating)**	**F_4 (sex)**	**F_5 (age)**	**F_6 (TF-IDF)**
R1	4	7	3	0	40	7
R2	2	8	1	1	55	20
. . .	. . .	. . .	. . .	. . .	. . .	
Rn	3	6	2	1	20	3

$$F_{Vector} = \begin{pmatrix} 4 & 7 & 3 & 0 & 40 & 7 \\ 2 & 8 & 1 & 1 & 55 & 20 \\ & & \ldots\ldots\ldots & & & \\ 3 & 6 & 2 & 1 & 20 & 3 \end{pmatrix} \qquad (2)$$

Opinion prediction using Two pass classifier using SVM and NN

After the feature selection process, the selected features are given to the input of the Two Pass . In this classifier, the support vector machine (SVM) is combined with artificial neural network (NN) to produce the output.

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To enhance the performance of the two pass classifier, the weight value is optimally selected with the help of modified grey wolf optimization (IGWO) algorithm. For hybridization process, the two pass classifier is created by adding together ANN and SVM classifiers. Here, at first the extracted features are given to the NN classifier. The output from hidden layer of the NN is given to SVM to train same target. On completion of SVM training, we get the trained two pass classifier. To enhance the performance of the two pass classifier, the weight value of is optimally selected with the help of IGWO algorithm. The structure of the optimal two pass classifier is given in figure 2.

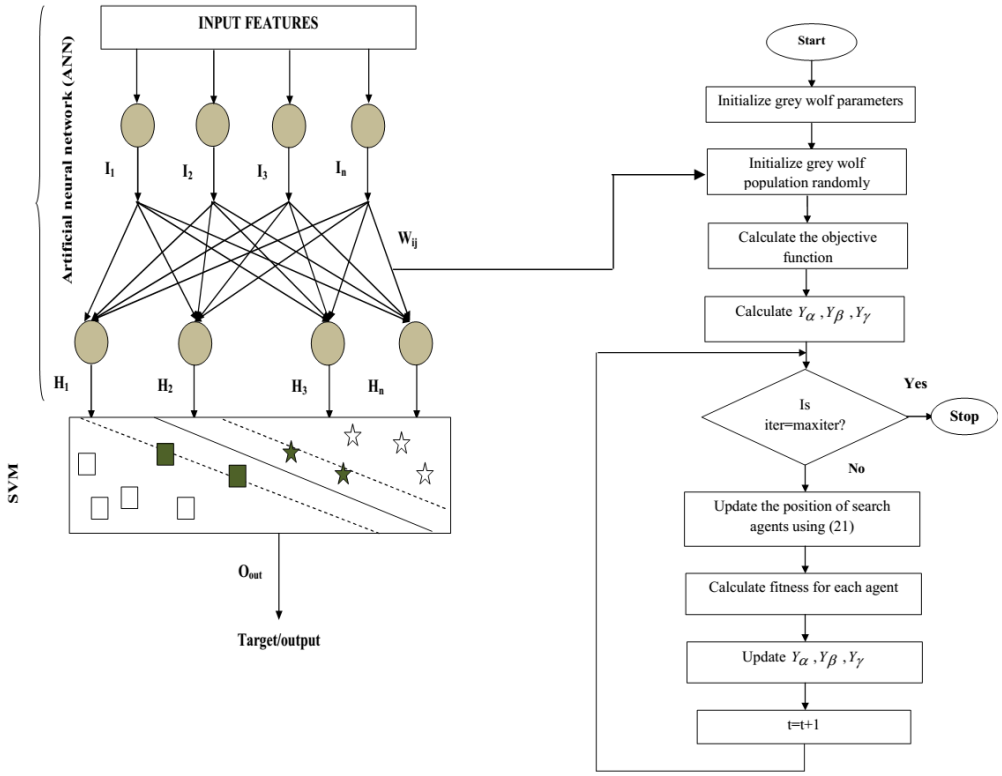

Figure 3: Overall structure of two pass classifier with new GWO updation formula

Weight optimization of Two pass classfier using IGWO Algorithm

For weight optimization process we modified GWO algorithm , a population based nature inspired algorithm, is utilized. The algoirthm is afflicted by hunting mechanism of grey wolves. The whole search space of the Grey Wolf algorithm is guided by three wolves namely alpha (α), beta (β) and gamma (γ). In the Grey Wolf algorithm, the best fitness solution in the population is called alpha (α) . Whereas the subsequent best wolves are beta (β) and lowest ranking grey wolves are called as gamma (γ). The remaining beings in the inhabitants are presumed as omega (ω). The hunting process is achieved by three steps such as (i) searching for prey, (ii) encircling prey and (iii) attacking prey. In the GWO algorithm, the hunting (optimization) is taken by α, β, γ . The

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sequence of the stepwise process of proposed weight optimization using modified GWO algorithm is put in plain words below.

Step 1: Solution initialization

The Solution initialization is a chief method for optimization process. The SVMNN weight value is assigned to the initial solution of optimization. Initially, the weight value is assigned randomly. The solution length is same as the size of the hidden neuron. The solution format is given in equation (3).

$$S_{ij} = \begin{bmatrix} 0.1 & 0.3 & 0.5 & 0.4 \\ 0.2 & 0.1 & 0.2 & 0.3 \\ & & \ldots\ldots\ldots & \\ 0.3 & 0.5 & 0.2 & 0.1 \end{bmatrix} \quad (3)$$

Step 2: Fitness calculation

After the solution initialization, the suitability of each solution is evaluated. In this paper, the maximum precision value is considered as the fitness function. The fitness function is given in equation (4).

$$Fitness = \max(P) \quad (4)$$

$$P = \frac{TP}{TP + FP} \quad (5)$$

Where, TP represent the true positive and FP represent the false positive.

Step 3: Updation using modified GWO

After the fitness calculation, the wolf updates his position using modified GWO algorithm. Initially, after finding the prey, the wolf is encircling the prey. The mathematical model of encircling process is explained in equation (6).

$$\vec{H} = \left| \vec{N} \,.\, \vec{Y}_p(i) - \vec{Y}(i) \right| \quad (6)$$

$$\vec{Y}(i+1) = \vec{Y}_p(i) - \vec{M} \,.\, \vec{H} \quad (7)$$

$$\vec{Y}_{(i+1)} = \vec{Y}_p(i) - \vec{M} \,.\left[\left| \vec{N} \,.\, \vec{Y}_p(i) - \vec{Y}(i) \right| \right] \quad (8)$$

Where;

i → Current iteration,

$\vec{Y}$ → Position vector of a grey wolf,

$\vec{Y}_p$ → Position vector of prey,

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$\vec{N}$, $\vec{M}$ →coefficient vectors

The coefficient vectors are computed using equation (9 and 10).

$$\vec{M} = 2.\vec{m}.\vec{r}_1 - \vec{m} \quad (9)$$

$$\vec{N} = 2.\vec{r}_2 \quad (10)$$

Where, $\vec{r}_1, \vec{r}_2$ are random vectors in [0, 1] and $\vec{m}$ is linearly reduced from 2 to 0.

$$\vec{m}(i) = \frac{2i}{MaxIter} \quad (11)$$

The best candidate solutions, that is $\alpha, \beta \; and \; \gamma$, have better knowledge about the potential location of prey. The other search agents (ω) update their positions allowing to the position of $\alpha, \beta, and \; \gamma$ as follows;

$$\vec{Y}_1 = \vec{Y}_a - \vec{M}_1 \left| \vec{N}_1.\vec{Y}_\alpha - \vec{Y} \right| \quad (12)$$

$$\vec{Y}_2 = \vec{Y}_\beta - \vec{M}_2 \left| \vec{N}_2.\vec{Y}_\beta - \vec{Y} \right| \quad (13)$$

$$\vec{Y}_3 = \vec{Y}_\gamma - \vec{M}_3 \left| \vec{N}_3.\vec{Y}_\gamma - \vec{Y} \right| \quad (14)$$

$$\vec{Y}_{(i+1)} = \frac{\vec{Y}_1(i) + \vec{Y}_2(i) + \vec{Y}_3(i)}{3} \quad (15)$$

The $\vec{M}$ is random value in the gap $[-2m, 2m]$. When random value $|M| < 1$ the wolves are forced to attack the prey. When $|\vec{M}| > 1$, the members of the population are enforced to diverge from the prey. Allowing to the position updated equation of GWO considered, the new candidate individual is generated by moving the old individual toward the global-best individual (α wolf), the second-best individual (β wolf), and the third-best individual (δ wolf). Therefore, the position updated equation considered by Eq. (15) is good at exploitation but poor at exploration. To overcome the problem with GWO novel Updation formula is developed with the help of Levy flight.

Step 4: Updation using IGWO algorithm

To improve the traditional GWO algorithm, the position updation formula is modified. The modified updation formula is given in equation (16).

$$\vec{Y}(i+1) = r_3 \times \frac{\vec{Y}_1(i) + \vec{Y}_2(i) + Y_3(i)}{3} + L \quad (16)$$

Where, the second term of equation (16) is a newly added term, r_3 is a random value and L represent the step length "L" of levy flight. Step length "L" of Levy flight can be calculated as follows;

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$$L = 0.01\frac{\mu}{|v|^{\frac{1}{\beta}}}\lambda \quad (17)$$

Where;

$\beta \rightarrow$ Constant value which is varies from 1 and 2.

The values $\mu, v, and\ \lambda$ are, respectively, drawn from normal distributions:

$$\mu \sim N\left(0, \sigma_\mu^2\right), \quad v \sim N\left(0, \sigma_v^2\right), \quad \lambda \sim N(0,1)$$

$$\sigma_\mu = \left[\frac{\Gamma\ (1+\beta)\sin\left(\pi\frac{\beta}{2}\right)}{\Gamma\left(\frac{(1+\beta)}{2}\right)\beta 2^{\left(\frac{\beta-1}{2}\right)}}\right]^{\frac{1}{\beta}}, \ \sigma_v = 1 \quad (18)$$

Where, Γ represent the gamma function.

We can start a global search by exploring new search areas. To improve mass exploration capability, the current iteration will target the worst grey (i.e. the lowest-performing) and then update its position with the Levy flight is given in equation 19.

$$Y_i^{new} = \vec{Y}(i+1) + L \quad (19)$$

Where;

$Y_i^{new} \rightarrow$ New position of i[th] grey

Step 5: Termination criteria

Stop if the maximum number of generations is reached. The best weight is selected and given to the two pass classifier for further processing.

Opinion Classificataion

After the optimal weight calculation, the weight value is assigned to the two pass classifier. Here, initially, the feature vector is given to the input of the input layer. The input layer is multiplied with weight value which is derived from the modified GWO. In this stage, we obtain the hidden neuron output. Then, the hidden neuron output is given to the input of the SVM. The final decision is done in SVM classifier.

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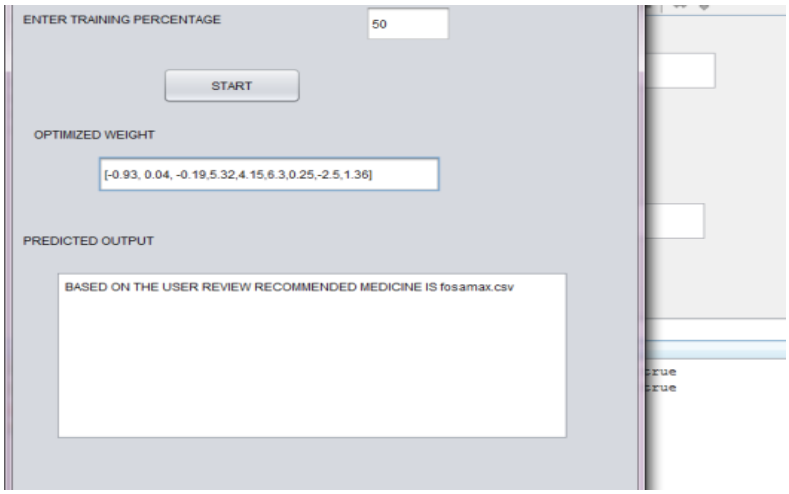

Figure 4: Sample screen shot during Training Phase

The stepwise explanation is given in Figure 5.

Step 1: Consider the NN which has three layers , to be exact they are the input layer, hidden layer and output layer. Every layer consists of number of neurons and the input neurons defined as (I_1, I_2....I_a), the hidden neuron defined as (H_1, H_2...H_b).

In this the output layer is replaced to SVM classifier. The weight connecting between input layer I_a and hidden layer H_b is defined as W_{ij} .

Step 2: Initially, each node i in the input layer, multiplied by a weight value among the hidden layer and the input layer. The hidden layer output is given in equation

$H_j = B_j + \sum_{i=1}^{n} I_i W_{ij}$,Where, B_j→ Bias value , W_{ij} → Weight value which is obtained from IGWO algorithm

Step 3: Then, the hidden layer output H_j is passed through tansig activation function. the activation function is givne in equation $F(H_j) = \frac{1}{1+e^{-H_j}}$

Step 4: The hidden layer output data is given to the input of the SVM. The SVM classifier trains the system using training with class data. After the training process, the system is stored. The trained structure is used for testing process.

Figure 5: Two pass Classifier Process

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Testing process

By using a training dataset , the neural network model is taught In the beginning, The weights for the neural network are optimized by using a new updation formula of GWO .To estimate the trained model, the planned model is validated with a predefined testing dataset.

In the testing process, we classify given input query as positive or negative. After the training process, the query drugs are given to the input of the system. For testing process, at first, the system automatically detects the important features and the features vectors are generated. Then, the features are given to the input optimal two pass classifier . Finally, at this stage, we obtain the features corresponding score value (Ω). Based on the score value, we classify the given query is of which class. In this work, we use two classes, so we fix one threshold value to classify the query. The threshold value is depending upon the class value only. The obtained score value (Ω) is less than the threshold (T_h) means, the given query is positive otherwise given query is negative. The condition of decision is given in equation (17.

$$decision = \begin{cases} T_h \geq score \; ; \; Positive \\ T_h < score \; ; \; Negative \end{cases} \tag{17}$$

IV. RESULT AND DISCUSSION

In this section, the performance of the presented approach for opinion mining is analyzed. The presented method is analyzed using Java (jdk 1.6) The datasets of two drugs have been used for the reviews to evaluate the performance of the presented opinion mining approach.

Evaluation metrics

Utilizing the following metrics, the evaluation of proposed opinion mining system is carried out as suggested by equations, provided below:

Precision: The proportion of the number of positive comment detected to the total number of positive and negative comment is used to calculate Precision as given in equation (18).

$$P = \frac{TP}{TP + FP} \tag{18}$$

Recall: The proportion number of positive comment detected to the total number of comment present in the dataset is used to calculate Recall as specified in equation (19).

$$R = \frac{TP}{TP + FN} \tag{19}$$

F-measure: The harmonic mean of precision and recalls metrics is the F-Measure as specified in equation (20).

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$$F = \frac{2PR}{P+R} \tag{20}$$

Here, TP→ True positive, FP→ False positive, FN→ False negative.

Experimental results

The aim of using meta-heuristic methods with a neural network is to get the most out of the aftermath of the neural network model.. The results revealed that the proposed adaptation enhanced the two pass classifier performance positively. In this proposed approach, the two pass classifier model is enhanced using the modified GWO to optimize the weights of the NN. Analyzing the drug satisfaction level is the primary aim of the presented approach. Two sorts of drug dataset are collected and utilized for the experimentation. The first dataset incorporates client review of the drug Cymbalta. Some500 reviews are used for training out of which 500 positive and 500 negative reviews were taken as sample. The features are selected using the presented MTF-IDF and weight of the two pass classifier is optimized by a novel formula in the updation mechanism of Grey wolf algorithm. For proving the effectiveness of the presented approach, the performance of the presented approach is judged against other approaches. The performance of the presented approach as per precision is detailed below;

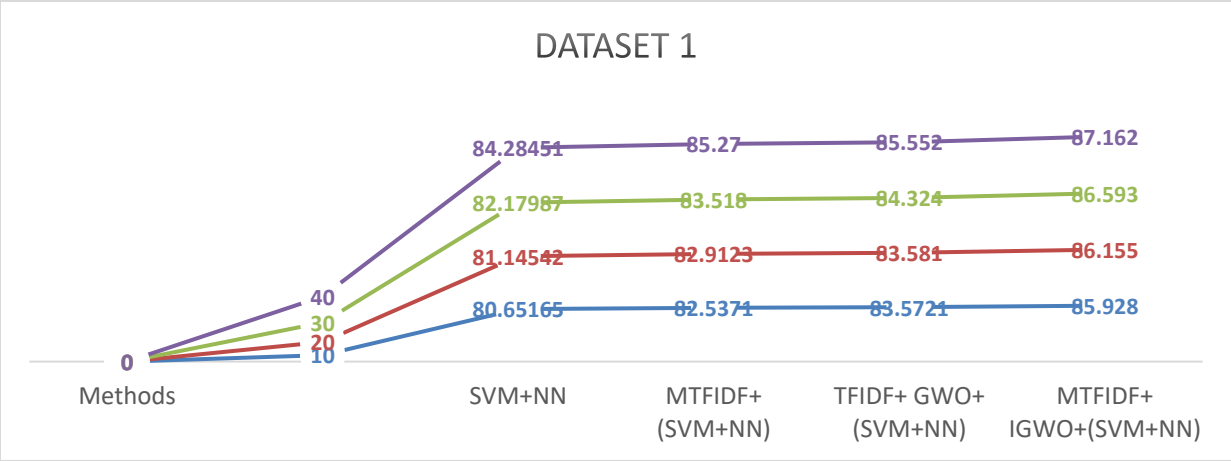

Figure 6: Performance analysis based on precision by varying iteration using dataset I

Figure 6 shows the Precison value of the proposed method MTFIDF+ IGWO+(SVM+NN),TFIDF+ GWO+ (SVM+NN),MTFIDF+ (SVM+NN) , (SVM+NN) for dataset 1 on various iterations. The Precision value of proposed method is 87.162, the Precision of TFIDF+ GWO+ (SVM+NN) is 85.552, the Precision of MTFIDF+ (SVM+NN)is 85.27, Precision of Two Pass SVM+NN is 84.28451and the F-measure of SVM is 70.84625 when the iteration is 40. Here, the proposed IGWO based two pass classifier has the highest precision value. Therefore it has been concluded that the proposed method has performed better than other compared methods in terms of Precision value. The classifier with a modified GWO applied on the NN. was used for classification of patient opinions on drug reviews. This study progresses on a former study on analysing drug satisfaction from patient reviews. The

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snags of back-propagation have been emphasized and the data have been composed from a former research work about drug satisfaction from patient reviews.

Table 2: Precision, recall, F-score, and accuracy of aspect level dataset 2

Aspect	Polarity	Precision	Recall	F-Score	Accuracy
Overall	Positive	0.77	0.76	0.74	0.81 (929/1136)
	Negative	0.70	0.71	0.59	
Side effect	Positive	0.59	0.72	0.62	0.73 (234/300)
	Negative	0.89	0.71	0.79	

The performance of the classifier at the aspect level of the opinions is shown in Table 7. Two sample aspects related to drugs such as: overall opinion rating and side effects are used. Here, the aspect based features are grouped manually. The opinions are split into two groups namely positive and negative. When analyzing table 2 proposed method attains the maximum accuracy.

V. CONCLUSION

The procedure used a modified GWO for optimization of weights of the two pass classifier .Since the position of the search agents was updated with an extra best solution, the proposed modification had a good effect, .In this work, , the drug manufacturer was suggested with the drug that is more satisfactory among the patients by classifying the opinions as positive and negative on their reviews ,Utilizing Improved Grey Wolf optimization along with the two pass classifier could be a probable solution for increasing the classification performance and shortening the training time Here, based on the features, the opinions from the client review are examined. Based on precision, recall, and f-measures, the performance of two datasets are analyzed. The experimental results show that the presented approach attains maximum precision and efficient level of recall and F-measure on comparing with other approaches that utilize SVM and Artificial neural network. It is concluded that the presented IGWO based opinion mining approach is effective. In future, the work can be extended to a larger dataset and new hybrid of techniques can be utilized for further enhancement of the performance of patient opinion mining to analyze drugs satisfaction.

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