Integration of SVM with Artificial Fish Swarm Algorithm for Blood Tumour Prediction

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Abstract—The growth of abnormal tissue is also called neoplasm which can be differentiated from the surrounding tissues by its structure. This tumour will affect the immune system which is a major leading cause of death around 13% worldwide. Blood diseases such as leukemia replaces the normal blood cells in the bone marrow and the blood. Effective modern drugs can be deployed for the blood diseases such as Chronic Lymphatic Leukemia (CLL). Data mining technique is used to categorize the blood test uniqueness (Hematology) and blood swelling to predict the disease in a early stage. Due to the increase in blood tumour diseases Support Vector Machine (SVM) is proposed for the classification of tumour and hematological data. Fish Swarm algorithm is found more efficient in optimizing the data with high accuracy.

Index Terms—Artificial fish swarm algorithm, Blood Tumour, Data mining, Hematology, Support Vector Machine.

I. INTRODUCTION
Blood tumour occurs when abnormal blood cells growing out of control through the blood and lymph system which fights off infection and produce new cells. This disease affects bone marrow, blood and lymphatic system. As the bone marrow produces new blood cells, the damaged white cells causes inability to produce normal blood cells. Hematology diseases such as leukemia, thalassemia, lymphoma etc. Leukemia cells are the major cause for affecting immune system. The medical aspects of Hematology is concerned with the treatment of blood disorders. One of the most common Hematology test is CBC (Complete Blood Count). CBC test check the figure of blood cells circulating in the blood stream. This test is used to detect and monitor the tumour treatment. As per 2018 survey, around 16.11% of humans suffer from blood tumour. Data mining technique is to extract the information from the datasets and transform it into an understandable data which categorize CBC sample of patient as Hematology or tumour. The prediction process of this diseases can reduce the number of mortalities and enhance the quality of life for the infected patients. The treatment depends on the features of leukemia cells including patient’s age and health. The discriminative classifier SVM is applied for predicting the Blood tumour with the identical features of Hematology. Fish Swarm algorithm is applied to optimize the probability of Hematology for the estimation of fitness value of blood cell count with high accuracy.

II. SURVEY
Data mining techniques is used to get new knowledge from the large number of data in the medical field. Some of the researchers done in the Hematological disease such as Abdullah and Al-Asmari to specify the anemia type from the patients through a predictive model. Datasets are constructed from the Complete Blood Count test results of the patients. The implemented classification algorithm such as Naive Bayes, Multiplier Perception, J48 and SMO. J48 decision tree and SMO produce the accuracy of 93.75%. They proposed to use Artificial Neural Network, SVM and Decision tree. But no actual experiment is done. Minnie and Srinivasan used Association Rules and the clusters on the collected data. Saichamna et al used Data mining technique to predict abnormality in peripheral blood smear by using dataset of Hematological parameters gathered from Blood cell counter. The Decision tree created by the algorithm can be used as a practical guideline for RBC morphological prediction by using four Hematological parameters (MCV, MCH, HCT and RBC). Finally Vijayarani and Sudha, developed Weight-based K-means algorithm for identifying Leukemia, inflammatory, bacteria or viral infection and anemia diseases from the Hemogram blood test samples from the dataset. They found that accuracy of weight-based K-means algorithm is better when compared to K-means and Fuzzy c-means algorithm.

Shuting Shen, Ziqiang Fan and Qiguo establish tumour prediction model by using logistic regression model is widely used to explore predictive morbidity of disease. Artificial Neural Networks have also been applied to the prediction of malignant tumour; they produced good results. BP neural network is a multilayer feed forward network in ANN which is trained by error back propagation algorithm. BP neural network showed high accuracy when compared to logistic regression because the neural network cannot explain the variables, it is best to combine them with each other during practical application. The grey GM (1,1) model was widely used in system of uncertainty with the implementation of forecast method. The grey GM(1,1) has no exact condition
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The system has implemented User login. The role of user login is to import a dataset which is collected from CBC test sample for training, testing, optimizing and classifying the dataset to predict the Blood tumour.

Table 1. Attributes Used

| NO. | SYMBOL | MEANING                                      |
|-----|--------|----------------------------------------------|
| 1   | WBC    | White Blood Cells                            |
| 2   | RBC    | Red Blood Cells                              |
| 3   | HGB    | Hemoglobin                                   |
| 4   | HTC    | Hematocrit                                   |
| 5   | MID    | Mid-range absolute count                     |
| 6   | MCH    | Mean Cellular Hemoglobin                     |
| 7   | MCHC   | Mean Cellular Hemoglobin Concentration       |
| 8   | RDW    | RBC Distribution Width                       |
| 9   | PLT    | Platelets Count                              |
| 10  | MPV    | Platelets Volume                             |
| 11  | GRAD   | Percentage of WBC with granules in their cytoplasm |
| 12  | LYM    | Lymphocyte percent                           |
| 13  | Gender | Male, Female                                 |
| 14  | Class  | Tumour, Hematology                           |

V. IMPLEMENTATION:

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C. FEATURE EXTRACTION

Feature extraction builds derived values, that is, the raw variables have been reduced to informative features which deploys the original datasets accurately. The reduced features are likely to contain relevant information from the input dataset so that the inclined dataset can be performed instead of the complete dataset.

D. OPTIMIZATION

Optimization obtains the best possible solutions among the various datasets. This technique attempts to optimize the required features for the desired solutions.

| ATTRIBUTES | RANGE |
|------------|-------|
| LYM        | <1.85 |
| RBC        | <3.64 |
| RDW        | >14.700 |
| GRAN       | >5.950 |

Table 2. Rules to predict tumour from CBC Samples

| ATTRIBUTES | RANGE |
|------------|-------|
| GRAN       | <5.100 |
| LYMP       | >2.250 |
| PLT        | >347  |
| GRAN       | >9.900 |

Table 3. Rules to predict Hematology from CBC Samples

In this journal, we use Artificial Fish Swarm Algorithm for the optimization of data in terms of the values given in the above table.

E. CLASSIFICATION

Classification is the process that segregates the outliers from the normal data. It is done by comparing the testing data with the trained data.

1. Condition for tumour
   a) If LYM <= 1.850 and RBC <= 3.635 then tumour.
   b) If RDW > 14.700 and GRAN > 5.950 then tumour.
   c) If GRAN > 2.800 and LYM <= 1.850 and RDW > 14.800 then tumour.
   d) If RBC <= 4.595 and HTC > 33.450 then tumour.
   e) If MCH > 25.750 and GRAN > 4.600 and HTC > 36.250 then tumour.

2. Condition for hematology
   a) If GRAN <= 5.100 and LYM > 2.250 then hematology.
   b) If PLT > 374 and GRAN = 9.900 the hematology.
   c) If RDW <= 15.200 and RBC <= 4.415 then hematology.

SVM is a concept in Statistics and Computer Science for a set of related supervised learning methods that analyze data and recognize patterns, used for classification and regression analysis. The standard SVM takes a set of input data and predicts, for each given input, which of two possible classes forms the input, making the SVM a non-probabilistic binary linear classifier. SVM is a powerful method for building a classifier it aims to create a decision boundary between two classes that enables the prediction of labels from one or more feature vectors. This decision boundary, known as hyperplane, is orientated in such a way that it is as far as possible from the closest data point from each of the classes. These closest points are called support vectors.

Here, We have proposed SVM to classify tumour and hematological diseases from CBC test samples based on the above mentioned conditions.

VI. CONCLUSION

We have proposed a model utilizing Kernel Support Vector Machine which is executed in a high arrangement PC. We have framed a disarray framework from the classifier. We have used 78% occurrences of approximately information for preparing both in Support Vector Machine and independently. The rest of the 10% cases utilized for testing both in SVM separately. The graphical portrayal of the disarray grid for every methodology. It portrays that the effectively distinguished esteem is relatively higher in SVM for preparing and testing. The execution estimates records are determined both for preparing and testing utilizing the above portrayed condition.

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