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Hematologic Diseases Detection Using Image Processing

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ABSTRACT: Blood has many secrets that affect human life. This change could be detected by the values of parameters inside blood analysis tests. Blood tests are widespread because of that; most physicians may recommend blood tests to predict the health level of the patient's body. Applying modern technological tools for helping physicians to improve the accuracy of disease diagnosing, become one of the hot topics of research, especially machine learning and artificial intelligence algorithms.The main objective of this research is using machine learning techniques for detecting blood diseases according to the blood tests values, several techniques are performed for finding the most suitable algorithm that maximizes the prediction accuracy.

KEYWORDS: blood disease, pre-processing, classifier algorithm, feature extraction, Convolutional neural network (CNN)etc.

I. INTRODUCTION

The manual method takes a long time and is prone to errors. It takes skilled experts to do the counting, and it can still be highly inaccurate. Although accurate and fast, the haematology analyzer is very expensive and cannot be afforded by every clinic/practitioner. Along with a blood report, the doctor will consider the patient's symptoms, medical history, vital signs such as blood pressure, breathing, pulse, temperature, and results from other tests and procedures. Various image processing techniques have been used as an alternative to the manual method in the past and have yielded positive results.

Blood has many secrets that affect human life. This change could be detected by the values of parameters inside blood analysis tests. Blood tests are widespread because of that; most physicians may recommend blood tests to predict the health level of the patient's body. Applying modern technological tools for helping physicians to improve the accuracy of disease diagnosing, become one of the hot topics of research, especially deep learning and artificial intelligence algorithms. The main objective of this research is using machine learning techniques for detecting blood diseases according to the blood tests values, several techniques are performed for finding the most suitable algorithm that maximizes the prediction accuracy. Blood is drawn from a person's vein using a needle or, in some cases, a finger prick during a blood test. Blood is analysed using a Hematology analyzer or by manually counting blood cells.

II. PROBLEM STATEMENT

Hematologic Diseases Detection using Machine Learning Algorithms

Quick and accurate medical diagnoses are crucial for the successful treatment of diseases.

For predicting the disease according to the blood analysis, patterns that lead to identifying the disease precisely should be recognized.

Using machine learning algorithms and based on laboratory blood test results, we have built models to predict a blood disease.

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III.PRIOR WORK

Papers used preprocessing techniques such as colour conversion, image segmentation, edge detection, and feature extraction along with a decision tree to identify dengue by classifying phagocytes and lymphocytes to identify dengue by classifying phagocytes and lymphocytes. The CNN algorithm was used to classify leukocytes and aid in disease identification. During feature extraction, various morphological factors such as perimeter, roundness of the cell, area, and so on are taken into account, which aids in classification. The WBCs were classified into five types using Multiclass SVM. WBCs were detected and classified using range filtering and the Level Set algorithm, respectively. Using grayscaling and otsu's method, the region of interest (ROI) was extracted during preprocessing. The second phase involves counting the blood components in the blood.

IV. EXISTING SYSTEM AND DISADVANTAGES

In existing system there is no computerizes system to identified the blood disease. Firstly, it is only suitable for the instance-level approaches that require an instance classifier. As we mentioned before, existing popular approaches of ML with neural networks are treat separated instances as inputs, then use a deep neural network use for only two classes.

V.ADVANCED SYSTEM AND ADVANTAGES

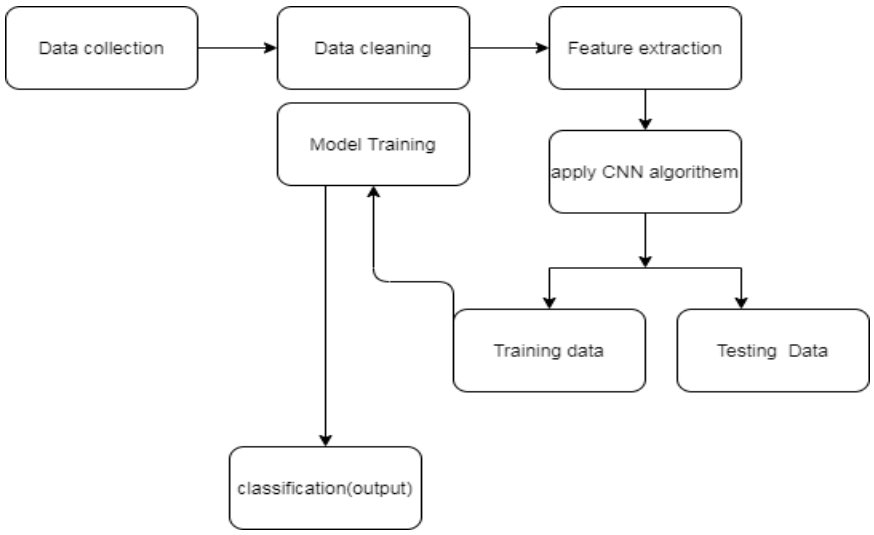
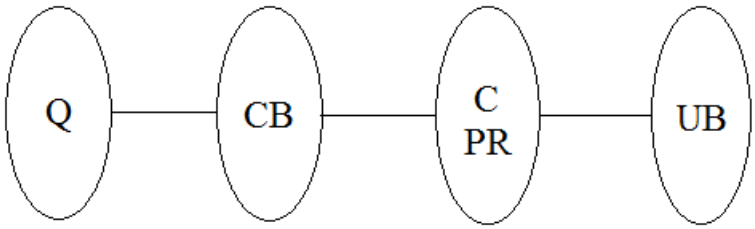


Figure 1: Advance System Architecture

VI.MATHEMATICAL MODELING



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Where,
Q = User entered input
CB = preprocess
C = feature selection
PR = preprocess request evaluation
UB = predict outcome

Set Theory

1) Let S be as system which input image
S = {In, P, Op, Φ}
2) Identify Input In as
In = {Q}
Where,
Q = User entered input image(dataset)
3) Identify Process P as
P = {CB, C, PR}
Where,
CB = Preprocess
C = feature selection
PR = Preprocess request evaluation
4) Identify Output Op as
Op = {UB}
Where,
UB = Predict outcome
Φ=Failures and Success conditions.

Failures:

1. Huge database can lead to more time consumption to get the information.
2. Hardware failure.
3. Software failure.

Success:

1. Search the required information from available in Datasets.
2. User gets result very fast according to their needs.

Space Complexity:

The space complexity depends on Presentation and visualization of discovered patterns. More the storage of data more is the space complexity.

Time Complexity:

Check No. of patterns available in the datasets= n
If (n>1) then retrieving of information can be time consuming. So the time complexity of this algorithm is O(nn).

Above mathematical model is NP-Complete.

VII. FUTURE SCOPE

Machine learning models can recognize disease-related blood laboratory patterns that are beyond current medical knowledge, resulting in higher diagnostic accuracy compared to traditional quantitative interpretations based on reference ranges for blood parameters.

Adopting a machine learning approach in blood laboratory-based diagnosis could lead to a fundamental change in differential diagnosis and reduce the late detection of disease which may cause to death. We can expand the scope of this system to another type of disease(covid-19,cancer, etc.)

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VIII.CONCLUSION

In this project we studied essential technique for modeling the human process in many disciplines, especially in the medical field, because of the high availability of data.One of the essential disease detectors is the blood analysis; as it contains many parameters with different values that indicates definite proof for the existence of the disease.The machine learning algorithmaccuracy depends mainly on the quality of the dataset; for this reason, a high-quality dataset is collected and verified from experts. This dataset is used for training the classifiers for obtaining high accuracy. This work would be implemented in our final year project. Deep learning models can recognize disease-related blood images that are beyond current medical knowledge, resulting in higher diagnostic accuracy compared to traditional quantitative interpretations based on reference ranges for blood parameters. Adopting a image processing approach in blood cell images diagnosis could lead to a fundamental change in differential diagnosis and reduce the late detection of disease which may cause to death. We can expand the scope of this system to another type of disease(covid-19,cancer, etc.) By expanding the learning algorithm, a deep learning model was proposed in this paper to diagnose diabetic peripheral neuropathy, hyperlipidemia, diabetes mellitus, and peripheral angiopathy. This paper investigated the performance of various models in diagnosing various diseases. In addition, this paper investigated the impact of various data quantification methods on model performance. Intelligent medical diagnosis requires an accurate and robust auxiliary diagnosis system based on medical text data. The goal of such intelligent medical diagnosis is to reduce clinicians' workload.

Furthermore, computer-assisted diagnosis lowers the risk of inter- and intra-observer variability. These systems have the potential to benefit patients by speeding up the medical diagnosis process. Because the method we propose does not artificially reduce raw data, new pathogenic factors may be discovered for clinical studies.

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