

## IMAGE CLASSIFICATION OF ABNORMAL RED BLOOD CELLS USING DEEP LEARNING

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### ABSTRACT

In the medical field, the analysis of the blood sample of the patient is a critical task. Abnormalities in blood cells are accountable for various health issues. Red blood cells (RBCs) are one of the major components of blood. Classifying the RBC can allow us to diagnose different diseases. The traditional, time-consuming technique of visualizing RBC manually under the microscope, is a tedious task and may lead to wrong interpretation because of the human error. The various health conditions can change the shape, texture, and size of normal RBCs. The proposed method has involved the use of image processing to classify the RBCs with the help of convolution neural networks. The algorithm can extract the feature of each segmented cell image and classify it into 9 various types. Images of blood slides were collected from the hospital. The overall accuracy was 94.04%. The system has been developed to provide accurate and fast results that can save patients' lives.

### 1. INTRODUCTION

#### 1.1 MOTIVATION

This methodology somehow is difficult and prone to human error. Thus, classifying the abnormal red blood cells using image

processing is created using the high technologies.

#### 1.2 PROBLEM DEFINITION

Mohammad Syahputra Et. Al (2017) said that morphological examination of peripheral blood smears done manually is less efficient and the shapes of the abnormal red blood cells found is not always the same for every analyst because of precision factor, concentration, and lack of knowledge.

#### 1.3 OBJECTIVE OF PROJECT

The objective of this study is to create a system that can classify 10 abnormal red blood cells and to know the reliability rate of classification of each abnormal red blood cells. Previous studies are usually limited to two to four abnormal red blood cell. Thus, the proponents aimed to create a maximized system.

#### 1.4 LIMITATIONS OF PROJECT

Moreover, a blood is made up of many parts, mostly the red blood cells, white blood cells, platelets and plasma. Abnormalities of red blood cells vary through size or anisocytosis, through shape or poikilocytosis, in color and even through the presence of inclusion bodies

## II. LITERATURE SURVEY

Pooja Tukaram Dalvi and Nagaraj Vernekar: Red blood cell classification and counting plays a very important role in detecting diseases like iron deficiency anemia, vitamin B12 deficiency anemia etc. In this research we intend to develop a standalone application that can classify the red blood cells into four abnormal types namely elliptocytes, echinocytes, tear drop cells and macrocytes. We will also provide the total red blood cell count. Thirteen Geometric features have been used to classify the red blood cells into the four abnormal types. We have used two data mining classifiers namely Artificial Neural Network and Decision Tree Classifier and we have compared the results of the two classifiers with respect to accuracy in classifying the red blood cells. The proposed method exhibits an accuracy of 95.27% for detecting elliptocytes, 96.06% for echinocytes, 85.82% for tear drop cells 85.82% for macrocytes and 89.76% for normal red blood cells.

Vishwas Sharma Et. Al: About 3.2 million people suffer from sickle-cell disease. Aim of this paper is to detect sickle cell anaemia and thalassaemia. The proposed method involves acquisition of the thin blood smear microscopic images, pre-processing by applying median filter, segmentation of overlapping erythrocytes using marker-controlled watershed segmentation, applying morphological operations to enhance the image, extraction of features such as metric value, aspect ratio, radial signature and its variance, and finally training the K-nearest neighbor classifier to test the images. The algorithm processes the infected cells increasing the speed, effectiveness and efficiency of training and testing. The K-Nearest Neighbour classifier is trained with 100 images to detect three different types of distorted erythrocytes namely sickle cells, macrocytes and elliptocytes responsible for sickle cell anaemia and thalassemia with an accuracy of 80.6% and sensitivity of 87.6%.

## III. SYSTEM ANALYSIS

Medical technicians, Pathologists and Hematologists usually used a manual microscopic method, to classify abnormal shapes of red blood cells. Morphological examination of peripheral blood smears done manually is less efficient and the shapes of the abnormal red blood cells found is not always the same for every analyst because of precision factor, concentration, and lack of knowledge

### DISADVANTAGES OF EXISTING SYSTEM:

It is depend upon manpower and cost effective.

It is time taking process.

### 3.1 PROPOSED SYSTEM:

This study used Decision-Tree Algorithm as a machine learning algorithm in classifying. As a result, the system detected and classified a total of ten abnormal red blood cells. Images used in the system came from hospitals' past patients. In addition, a camera is used to capture the slides. The image was then inserted into the program. The system processed and classified the image. In effect, the results show the name of the abnormal red blood cells detected in the image within the system including the soft copy of the list.

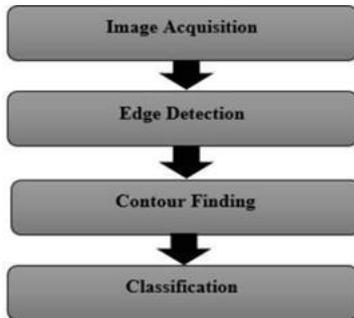
### ADVANTAGES OF PROPOSED SYSTEM:

The average reliability rate is 89.31%. The average error rate of 10.69% was encountered mostly from node H

The results show the name of the abnormal red blood cells detected in the image

## IV. SYSTEM DESIGN

### SYSTEM ARCHITECTURE:



## V. IMPLEMENTATION

### 5.1 MODULES:

#### Data Collection

The dataset used in image dataset .And the composition of the dataset.understand the relationship among different features. A plot of the core features and the entire dataset.The dataset is further split into 2/3 for training and 1/3 for testing the algorithms. Furthermore, in order to obtain a representative sample, each class in the full dataset is represented in about the right proportion in both the training and testing datasets. The various proportions of the training and testing datasets used in the paper.

#### Data Preprocessing

The data which was collected might contain missing values that may lead to inconsistency. To gain better results data need to be preprocessed so as to improve the efficiency of the algorithm. The outliers have to be removed and also variable conversion need to be done. In order to overcoming these issues we use map function.

#### Model Selection

Machine learning is about predicting and recognizing patterns and generate suitable results after understanding them. ML algorithms study patterns in data and learn from them. An ML model will learn and improve on each attempt. To gauge the effectiveness of a model, it's vital to split the data into training and test sets first. So before training our models,

we split the data into Training set which was 70% of the whole dataset and Test set which was the remaining 30%. Then it was important to implement a selection of performance metrics to the predictions made by our model.

#### Predict the results

The designed system is tested with test set and the performance is assured. Evolution analysis refers to the description and model regularities or trends for objects whose behavior changes over time. Common metrics calculated from the confusion matrix are Precision; Accuracy. The not important features since these features are to develop a predictive model using ordinary DT model.

### 5.2 ALGORITHM:

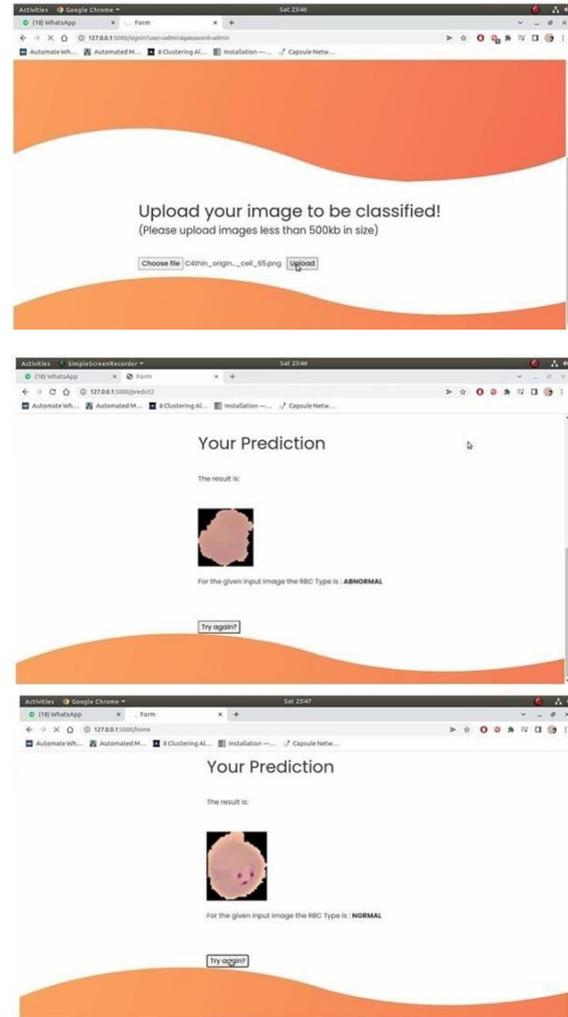
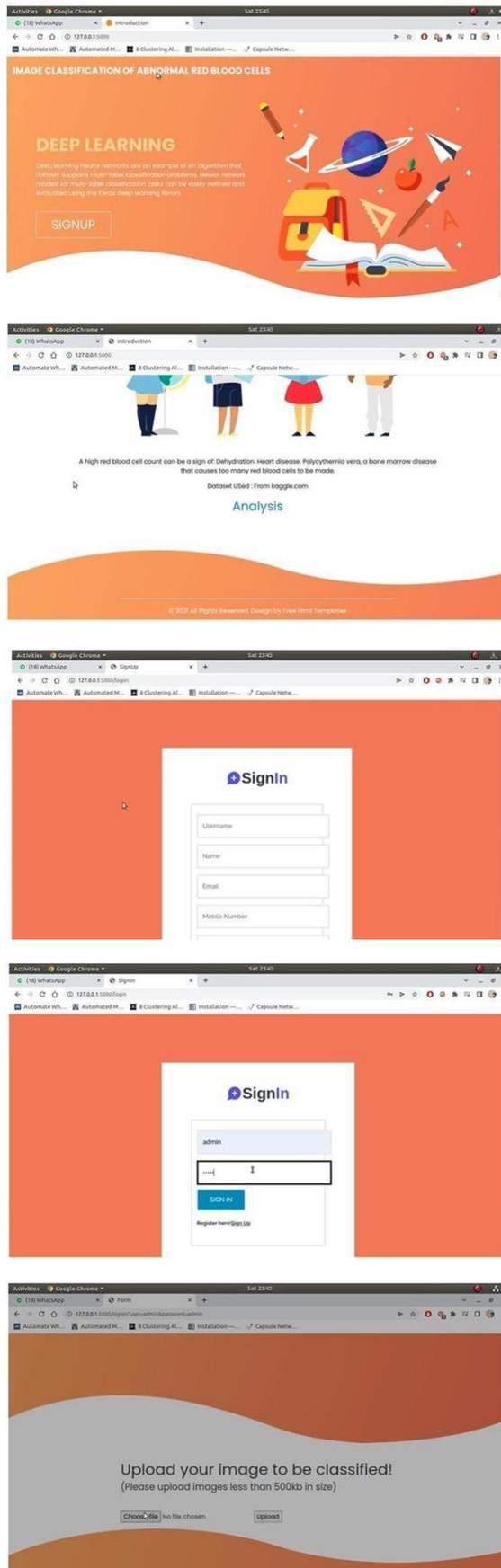
#### 5.2.1 Decision Tree Classifier:

Decision Tree is a supervised machine learning algorithm used to solve classification problems. The main objective of using Decision Tree in this research work is the prediction of target class using decision rule taken from prior data. It uses nodes and internodes for the prediction and classification. Root nodes classify the instances with different features. Root nodes can have two or more branches while the leaf nodes represent classification. In every stage, Decision tree chooses each node by evaluating the highest information gain among all the attributes.

#### 5.2.2 InceptionV3 model:

Inception v3 is an image recognition model that has been shown to attain greater than 78.1% accuracy on the ImageNet dataset. The model is the culmination of many ideas developed by multiple researchers over the years. The Inception V3 is a deep learning model based on Convolutional Neural Networks, which is used for image classification. The inception V3 is a superior version of the basic model Inception V1 which was introduced as GoogLeNet in 2014. As the name suggests it was developed by a team at Google.

**VI.INPUT AND OUTPUT SCREENS**



**VII.CONCLUSION**

Inception-V3 can be used as a classification for the abnormal red blood cells found in the blood. The system was able to classify the abnormal red blood cells using Inception-V3 model based on the data gathered from the 40 images that were composed of 600 sample cells. Errors in classifications were result of small differences between the attributes used. Abnormal red blood cells like elliptocytes and ovalocytes almost have the same parameters and attributes resulting to difficulty in classifying the two abnormal red blood cells . The accuracy rate rate is 94.02%.

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