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AUTOMATION OF RBC/WBC COUNTING

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Abstract: Fast and cost-effective production of blood cell count reports are of supreme importance in the healthcare industry. The traditional method of manual counting under a microscope gives inaccurate results. Due to high vulnerability in human error and large time consumption, an automated system is required to perform this task with more accuracy and speed. As a solution to this, the project proposes a technique of image processing for counting the number of blood cells. The main goal of this project is to reduce the manual counting errors and time consumed by humans and attaining the maximum accuracy possible

Index Terms **- Machine Learning, Image Processing, Computer Vision, Object detection, Image Classification.**

I. INTRODUCTION

Nowadays, everything seems to be fast while we work on the computer and its data available on the internet which can be accessible or retrievable at any moment of time. So that each task that is related to computers can be done at better speed rate and accuracy. While such as in the medical line, computer technology has been proven to be more helpful/useful. But, there are still some tasks that are being carried out manually, so there are some previously implemented technologies that came up with counting of cells to be done with computer vision instead of manually counting. So that the RBC/WBC are counted on the basis of the cells visible in microscopic images. Computer vision is a field of AI that enables computers to derive meaningful information from digital images and take actions based on that information

II. AIMS AND OBJECTIVE

Our goal is to provide an easy-to-use software application which will help medical staff to count the cells in blood cells.. To make it more useful, we included more capabilities such as interface with ease of use. Our goal is to create a quality based simple and easy to use application for the people working in the medical field as well as non-experts. To reduce human error by eliminating most of the human interaction and automating the process Allowing staff to complete their work by reducing hectic manual work.

III. METHODOLOGY

The system we are proposing will take the input based on the human need such as when user will input the microscopic blood image ,system will process the image with technique in which image will be converted to grayscale(Black/White) and *CHT* algorithm will be applied which will maps the radius of the circles on the microscopic image where if the radius of the circles is greater on average circles then that circle(*cells*) can be considered as white blood cells(WBC) and circles(*cells*)which are smaller will be considered as Red blood cells. The proposed system which is trained on the different datasets (consist of different microscopic blood cells images)will help to predict the blood cells count. Since there is a possibility in the system where it will count the same cells twice, we have used the KNN and IOU algorithm to avoid overlapping of two cells so counting accuracy won't be affected.

3.1 Figures

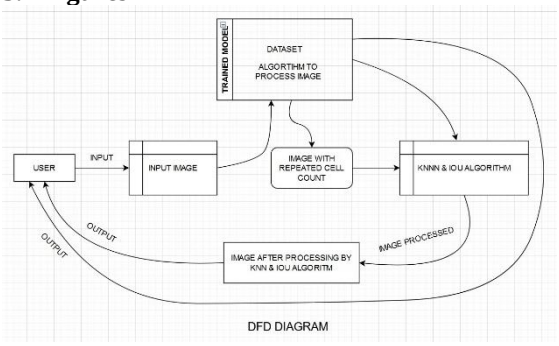

Fig. 3.1 Data flow Diagram

The user will initially load the input microscopic blood image as where image will be processed according to algorithm and will be compared to trained datasets to calculate the different aspects of images and will count the cells and KNN process will took place where it will look for two overlapping cells to see if the particular cell has been count twice or not. If cells count is accurate it will return the output to the user.

IV. Analysis and Discussion

WINDOWS is the most widely used operating system in the industries because of the following reasons: Its Beginner-friendly large range of software, Community Support, and many other factors. Along with Windows, this App is desktop-friendly. So, would it be helpful to have an application which gives all that power to the user in an extremely easy to use manner. This ensures to make responsible use of it, and it helps make the application safe. Here are the code snippets to hint at the logic behind the application. The following application is fully functional, but we'll be working on its deployment and improvement of UI and UX design. The project can easily be administered under various conditions. Flutter gives a framework where we can add new features as and when we require, making reusability possible as there is flexibility in all the modules. The language used for developing the project is Python as it is quite advantageous than other languages in terms Python is an object-oriented, class-based, garbage-collected language with simple syntax. Python can compile to either native code. It supports interfaces, mixings, abstract classes, reified generics, and type inference.

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4.1 Figures

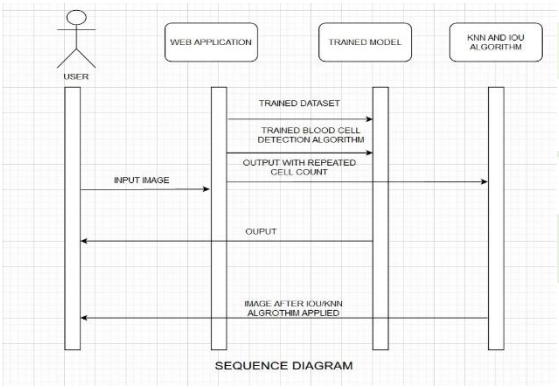

Fig 4.1 Sequence Diagram

The above figure shows the sequence of different tasks involved in a desktop application. First user uploads the image as input then image gets processed with defined algorithm which converts image to grayscale so that cells which are in the circle form can be measured by their radius and will be counted .if there's any cells that are overlapping each other than KNN and IOU algorithm will be applied to differentiate between those overlapping cells and count them as each cell so that repeated counting of cell can be prevented and best possible count can be delivered to user.

4.2 Architecture

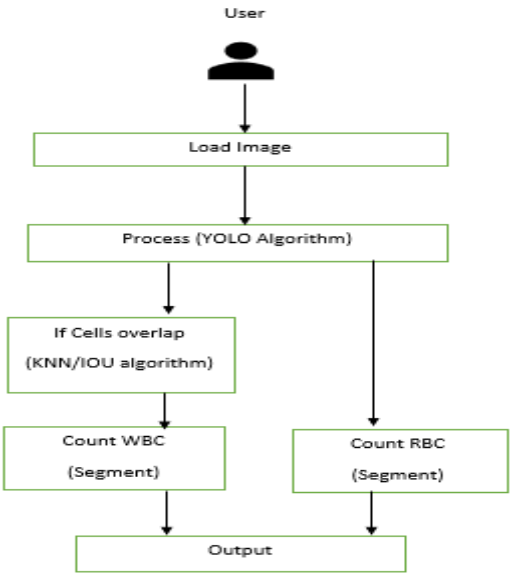

Fig 4.2 Architecture Diagram

The above figure illustrates the architecture of our application .Firstly user sees the Loaded Image and Process window. By loading image user will see the loaded image on right-hand side, will have next option to process where image will be process using pre-defined algorithm which has been trained with dataset to identity the cells in image with bounding boxes with each cells measurement which help to understand whichever cells have greater radius compared to average cell's radius those are white blood cells because the white blood cells are bigger compared to red blood cells. Then next step is to differentiate between the two overlapped cells which can be count twice for that KNN/IOU algorithm are applied which filters the overlapping cells and gives the clear count of cells. It helps to prevent counting each cell more than once. In the next step which counts the WBC/RBC cells by segmenting the both type of cells when counting them

V. Result

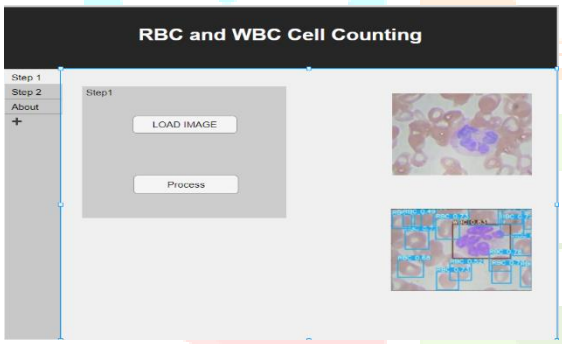

Fig 5.1 Image Uploading Screen

The above figure shows the User Interface of the application through which users will be able to interact with the application in an easier way. We have kept the application interface simple so that every person in the respective field will be able to understand as well as will be able to use the application without any extra assistance. The above figure shows three steps that are implemented in application: First step is the primary window where users will select their input, upon which selected input image will be displayed at right hand-side so that user will be able to see the selected input. After that user will click on "Process" which will process the image according to the algorithm then it will display the processed image same as selected input with cells in bounding boxes with their radius.

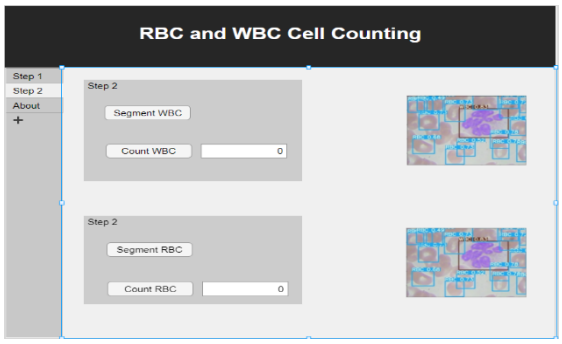

Fig 5.2: Output Screen

This figure displays the second steps with the secondary window to count the WBC and RBC count by segmenting the processed image during each count of WBC and RBC. While counting the white blood cells the image will be segmented where it will overlap the white blood cells with red blood cells so that only white blood cells can be counted configuring the red blood cells. And the same can be done to count the red blood cells by configuring the white blood cells, So that counting each one can be done as accurately as possible.

Table 4.1: Descriptive Statics

VI. ACKNOWLEDGMENT

We would hereby make the most of the opportunity by expressing our sincerest thanks to our mentor and all our faculties whose guidance gave us conceptual understanding and clarity of comprehension, which ultimately made our job easier. Credit also goes to all my team members who have kept us in good stead. We would also like to thank the authors of the papers who introduced us to the various kinds of approaches for this opportunity so that we can write the literature review on their paper.

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