

# **MALARIA DETECTION USING IMAGE PROCESSING**

PROJECT REPORT

Submitted by

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**SNG20MCA-2013**

under the guidance of

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**to**

**The APJ Abdul Kalam Technological University**

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of

*Master of Computer Applications*



**Department of Computer Applications**

**Sree Narayana Gurukulam College of Engineering**

**Kolenchery, Kadayirippu P.O, Ernakulam-682311**

JULY 2022

## **DECLARATION**

I undersigned hereby declare that the project report **MALARIA DETECTION USING IMAGE PROCESSING**, submitted for partial fulfillment of the requirements for the award of degree of Master of Computer Applications of the APJ Abdul Kalam Technological University, Kerala is a bonafide work done by me under supervision of **Asst.Prof.Anjali Sankar**. This submission represents my ideas in my own words and where ideas or words of others have been included, I have adequately and accurately cited and referenced the original sources. I also declare that I have adhered to ethics of academic honesty and integrity and have not misrepresented or fabricated any data or idea or fact or source in my submission. I understand that any violation of the above will be a cause for disciplinary action by the institute and/or the University and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been obtained. This report has not been previously formed the basis for the award of any degree, diploma or similar title of any other University.

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**CERTIFICATE**

This is to certify that the report entitled **MALARIA DETECTION USING IMAGE PROCESSING** submitted by **ASWANI M** (SNG20MCA-2013) to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the Degree of Master of Computer Applications is a bonafide record of the project work carried out by him/her under our guidance and supervision. This report in any form has not been submitted to any other University or Institute for any purpose.

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**NXG/EKM/136-80/142E**

**02 July,2022**

**TO WHOMSOEVER IT MAY CONCERN**

This is to certify that **Ms. Aswani M** fourth semester MCA student of SNGCE, Kadayiruppu has successfully completed her project and internship program titled "**Malaria Detection using Image Processing**".

She has completed her internship from **05th April, 2022** to **05th July, 2022** under the guidance of Mr. Gokul Vishnu in partial fulfilment of the requirements for the award of the degree of, Master of Computer Application. During the period of her internship program with us, she was found diligent, hardworking and inquisitive.

We wish her every success in her life and career.

Yours Truly,

For,

**NextGenPro Innovations & Edupark Pvt Ltd**



Shabna Sara Jithin  
HR Manager

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I thank God almighty for guiding me throughout the project. I would like to thank all those who have supported to the completion of the project and helped me with valuable suggestions for improvement.

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Above all I would like to thank my parents without whose blessings, I would not have been able to accomplish my goal.

**ASWANI M**

## **ABSTRACT**

Malaria is one of the deadliest diseases ever exists in this planet. Automated evaluation process can notably decrease the time needed for diagnosis of the disease. This will result in early onset of treatment saving many lives. As it poses a serious global health problem, we approached to develop a model to detect malaria parasite accurately from giemsa blood sample with the hope of reducing death rate because of malaria. In this work, we developed a model by using color based pixel discrimination technique and Segmentation operation to identify malaria parasites from thin smear blood images. Various segmentation techniques like watershed segmentation, HSV segmentation have been used in this method to decrease the false result in the area of malaria detection. We believe that, our malaria parasite detection method will be helpful wherever it is difficult to find the expert in microscopic analysis of blood report and also limits the human error while detecting the presence of parasites in the blood sample.

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## **MALARIA DETECTION USING IMAGE PROCESSING**

# 1 INTRODUCTION

## 1.1 Project Background

Malaria is one of the severe diseases caused by the protozoan parasites of the genus *Plasmodium*, transmitted via female *Anopheles* mosquito. During the process of complex life cycle of parasites in growing and reproducing inside the human body, the red blood cell (RBCs) are used as hosts and destroyed afterwards. World Health Organization estimates that in 2015 mentioning in their website <http://www.who.int/en/>, 212 million clinical cases of malaria occurred, and 429,000 people died of malaria, most of them children in Africa. Also as malaria causes so much illness and death, the disease hampers on many national economies and WHO also discovers that many countries with malaria are already among the poorer nations it is difficult for them to break the a vicious cycle of disease and poverty. Normally malaria happened because of four types of plasmodium species called *Plasmodium falciparum*, *Plasmodium vivax*, *Plasmodium ovale*, *Plasmodium malariae*. Among all of this *Plasmodium falciparum* is responsible for malaria fever in most of the cases.

## 1.2 Existing System

There is already existing system they include After collecting blood samples, the diagnosis of malaria infection is done by searching for parasites in blood slides through a microscope by experts most of the cases by a pathologist. blood sample with the presence of malaria parasites in blood cell. Recognition and detection of parasite in blood sample can be possible by applying a chemical process called (Giemsa) staining. This process slightly colorizes the red blood cell (RBC) and plasmodium parasites. The detection of the *Plasmodium* parasites requires detection of the stained objects. To prevent the false result, this stained objects need to analysed further to determine whether they are parasite or not.

## 1.3 Proposed System

I approached to develop a model to detect malaria parasite accurately from giemsa blood sample with the hope of reducing death rate because of malaria. In this work, I developed a model by using color based pixel discrimination technique and Segmentation operation to identify malaria parasites from thin smear blood images. Various segmentation techniques like watershed segmentation, HSV segmentation have been used in this method to decrease the false result in the area of malaria detection.

We believe that, our malaria parasite detection method will be helpful wherever it is difficult to find the expert in microscopic analysis of blood report and also limits the human error while detecting the presence of parasites in the blood sample.

### 1.3.1 Benefits of Proposed System

- User friendliness and interactive.
- Easy classification

## 1.4 Basic Architecture of the Project

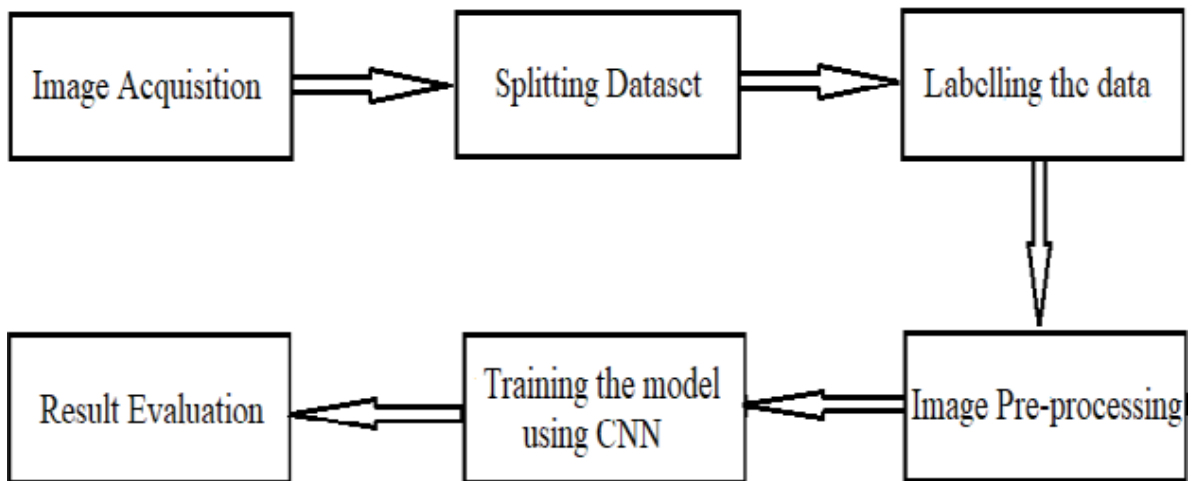


Fig. 1. Block Diagram

## **2 SYSTEM ANALYSIS**

### **2.1 Identification of Need**

System analysis is the reduction of the entire system by studying various operations and their relationships with the system and the requirements of bit successor. A system can be defined as an orderly grouping of interdependent components linked together according to plan to achieve a specific objective. The idea of the system has become most practical and necessary in conceptualizing the interrelationships and integrations of operations especially when using computers. Organizing consists of several interrelated and interacting components. Analysis is the detailed study of various operations performed by the system and their relations within and outside the system. During analysis, data are connected on the available files, decision points and is handled by the present system.

### **2.2 Preliminary Investigation**

Preliminary analysis is the initial process at the start of the project that determines whether the concept is viable. It looks at economic, market, industry and social trends that influence the success of business endeavours associated with a proposed strategy. Preliminary analysis is repeated in situations where primary investigations trigger updates to plan. Conducting a preliminary analysis of a business strategy allows the organization to see the viability of an intended goal. It creates a comprehensive idea of the enterprise objective and states the outcome is meant to be expressed.

### **2.3 Feasibility Study**

Feasibility analysis is the procedure for identifying the candidate system, evaluating and effecting the most feasible system. This is done by investigating the existing system in the area under investigation or generally ideas about a new system. It is a test of a system proposal according to its work ability, impact on the organization, ability to meet user needs, and effective use of resources feasibility study is made to see if the project on completion will serve the purpose of the organization for the amount of work, effort and the time that spend on it. Feasibility study lets the developer for see the future of the project and the usefulness. A feasibility study of system proposal is according to its work ability, which is the impact on the organization, ability to meet their user needs and effective use of resources. Thus, when a new application is proposed it normally goes through a feasibility study before it is approved for development. The document provides the feasibility of the project that is being designed and lists various areas that were considered very carefully during the feasibility study of this project such as Technical, Economic, Operational and social feasibility's.

### **2.3.1 Technical Feasibility**

Technical Feasibility checks the work for the project be done with current equipment, existing software technology and available personal. And if technology is required, what is the likelihood that it can develop. Also checks whether the proposed system guarantees accuracy, reliability, data security and ease of access. All the resources or implementing this software is available in this project.

### **2.3.2 Economical Feasibility**

It will reduce expenditure and improve the quality of service. A system can develop technically and that will used if the installed must still be a good investment for the public. Financial benefits must exceed the cost. In the case of proposed system, performance of the system is effective of its accuracy, faster response and user friendly in nature. The campus-wide community for events and placements reduce unnecessary expenses and wastage of many hours by its capabilities of fast operations.

### **2.3.3 Operational Feasibility**

People are inherently to change, and computers have been known to facilitate change. An estimate should be made about the reaction of the user, staff towards the development of a computerized system. Computer installations have something to do with turnover, transfer and changes in job status. Proposed projects are beneficial only if that can be turned in to information system that will meet the organizations operating requirements. In-operational feasibility study the management and users were found to have interest for a change. Since the system is user friendly and training is less needed.

### **2.3.4 Social Feasibility**

Social feasibility one of the feasibility study where the acceptance of the people is considering regarding the product to be launched. This is concerned with the effect on employees and customers on the introduction of a new system. Will it result in redundancies? Will some jobs be deskilled? Is there a need for retraining? Will the workforce be able to cope with the new changes? Will the workforce have to relocate? It is imperative that users are being involved and their cooperation is secure before changes are made. Equally the effects on user services has to be identified. Due to this project is socially feasible.



## 2.4 Project Planning

The project will go through the following stages of development in its Software Development Life Cycle.

Scrum is a subset of agile. Scrum is a framework within which people can address complex adaptive problems, while productively and creatively delivering products of the highest possible value. Scrum itself is a simple framework for effective team collaboration on complex products. Scrum cocreators Ken Schwaber and Jeff Sutherland have written The Scrum Guide to explain Scrum clearly and succinctly. This Guide contains the definition of Scrum

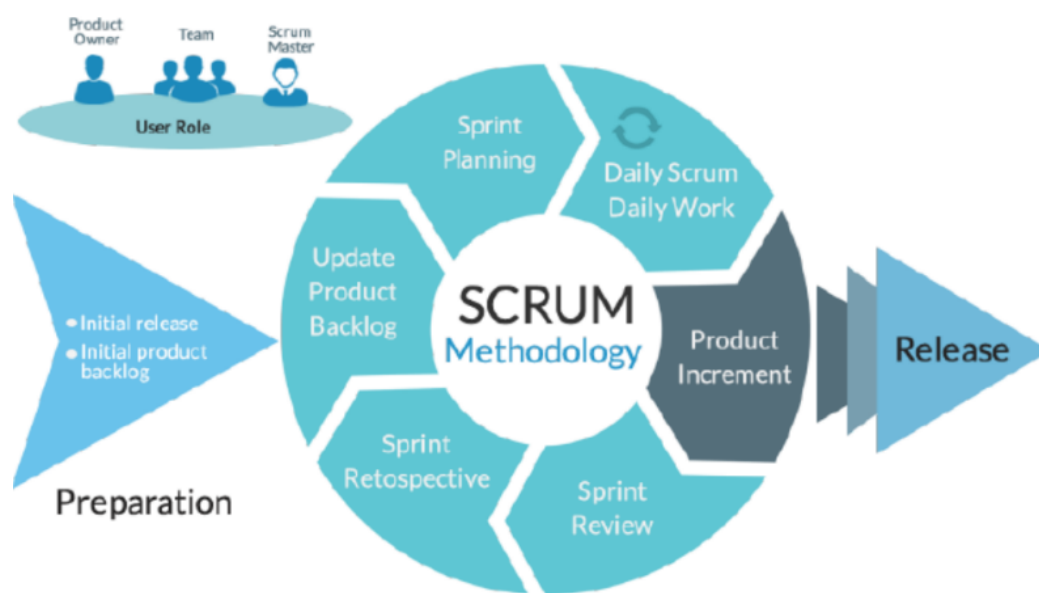


Figure 2.1: Project Planning

## 2.5 Development Environment

### 2.5.1 Python

Python is one of the most used programming languages for machine learning and data science. created by Guido Van Rossum in 1989. It is a high-level programming language which supports multiple programming paradigms and has a large and comprehensive standard library and an awesome community. What this means is that you easily get small pieces of code to accomplish a lot of tasks and you just have to take care of the high-level functionality of your program. You also get a lot of support from the forums and online community if you run into any issues or are looking for optimal implementations of various tasks. It is ideally designed for rapid prototyping of complex applications. It has interfaces to many OS system calls and libraries and is extensible to C or C++. Many large companies use the Python programming language include NASA, Google, YouTube, BitTorrent, etc. Python programming is widely used in Artificial Intelligence, Natural Language Generation, Neural Networks and other advanced fields of Computer Science.

The Python library provides base-level items, so developers do not have to write code from scratch every time. Machine learning requires continuous data processing, and Python libraries allow you to access, process, and transform your data. These are some of the most extensive libraries available for AI and ML

Python's large standard library provides tools suited to many tasks, and is commonly cited as one of its greatest strengths. For Internet-facing applications, many standard formats and protocols such as MIME and HTTP are supported. It includes modules for creating graphical user interfaces, connecting to relational databases, generating pseudorandom numbers, arithmetic with arbitrary-precision decimals, manipulating regular expressions, and unit testing. Libraries such as NumPy, SciPy, and Matplotlib allow the effective use of Python in scientific computing, with specialized libraries such as Biopython and Astropy providing domain-specific functionality. SageMath is a computer algebra system with a notebook interface programmable in Python: its library covers many aspects of mathematics, including algebra, combinatorics, numerical mathematics, number theory, and calculus. OpenCV has Python bindings with a rich set of features for computer vision and image processing.

### 2.5.2 PHP

PHP (recursive acronym for PHP: Hypertext Preprocessor) is a widely-used open source general-purpose scripting language that is especially suited for web development and can be embedded into HTML. Instead of lots of commands to output HTML (as seen in C or Perl), PHP pages contain HTML with embedded code that does "something" (in this case, output "Hi, I'm a PHP script!"). The PHP code is enclosed in special start and end processing instructions `<?php` and `?>` that allow you to jump into and out of "PHP mode."

What distinguishes PHP from something like client-side JavaScript is that the code is executed on the server, generating HTML which is then sent to the client. The client would receive the results of running that script, but would not know what the underlying code was. You can even configure your web server to process all your HTML files with PHP, and then there's really no way that users can tell what you have up your sleeve. Common uses of PHP:

- PHP performs system functions, i.e. from files on a system it can create, open, read, write, and close them.
- PHP can handle forms, i.e. gather data from files, save data to a file, through email you can send data, return data to the user.
- You add, delete, modify elements within your database through PHP.
- Access cookies variables and set cookies.
- Using PHP, you can restrict users to access some pages of your website.
- It can encrypt data.

### 2.5.3 Jupyter Notebook

Project Jupyter is a non-profit, open-source project, born out of the IPython Project in 2014 as it evolved to support interactive data science and scientific computing across all programming languages. Jupyter will always be 100 percent open-source software, free for all to use and released under the liberal terms of the modified BSD license.

JSJupyter is developed in the open on GitHub, through the consensus of the Jupyter community. For more information on our governance approach, please see our Governance Document. All online and in-person interactions and communications directly related to the project are covered by the Jupyter Code of Conduct. This Code of Conduct sets expectations to enable a diverse community of users and contributors to participate in the project with respect and safety.

### 2.5.4 HTML

Hypertext Mark-up Language (HTML) is the standard mark-up language for creating web pages and web applications. With Cascading Style Sheets (CSS) and JavaScript it forms a triad of cornerstone technologies for the World Wide Web. Web browsers receive HTML documents from a web server or from local storage and render them into multimedia web pages. HTML describes the structure of a web page semantically and originally included cues for the appearance of the document.

### 2.5.5 Deep learning

Deep learning is a machine learning technique that teaches computers to do what comes naturally to humans: learn by example. Deep learning is a key technology behind driverless cars, enabling them to recognize a stop sign, or to distinguish a pedestrian from a lamppost. It is the key to voice control in consumer devices like phones, tablets, TVs, and hands-free speakers. Deep learning is getting lots of attention lately and for good reason. It's achieving results that were not possible before.

In deep learning, a computer model learns to perform classification tasks directly from images, text, or sound. Deep learning models can achieve state-of-the-art accuracy, sometimes exceeding human-level performance. Models are trained by using a large set of labeled data and neural network architectures that contain many layers.

### 2.5.6 CNN

In deep learning, a convolutional neural network (CNN/ConvNet) is a class of deep neural networks, most commonly applied to analyze visual imagery. Now when we think of a neural network we think about matrix multiplications but that is not the case with ConvNet. It uses a special technique called Convolution. Now in mathematics convolution is a mathematical operation on two functions that produces a third function that expresses how the shape of one is modified by the other.

Convolutional neural networks are composed of multiple layers of artificial neurons. Artificial neurons, a rough imitation of their biological counterparts, are mathematical functions that calculate the weighted sum of multiple inputs and outputs an activation value. When you input an image in a ConvNet, each layer generates several activation functions that are passed on to the next layer

The first layer usually extracts basic features such as horizontal or diagonal edges. This output is passed on to the next layer which detects more complex features such as corners or combinational edges. As we move deeper into the network it can identify even more complex features such as objects, faces, etc.

Based on the activation map of the final convolution layer, the classification layer outputs a set of confidence scores (values between 0 and 1) that specify how likely the image is to belong to a “class.” For instance, if you have a ConvNet that detects cats, dogs, and horses, Crowd Detection and Safe Distance Tracking 16 Department of Computer Applications, SNGCE the output of the final layer is the possibility that the input image contains any of those animals.

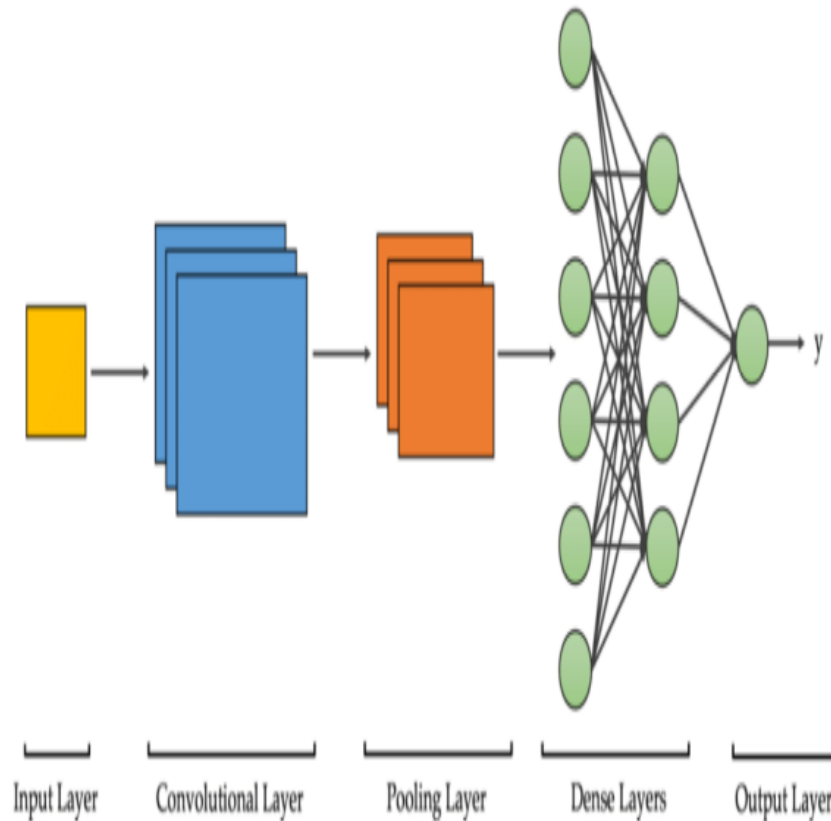


Figure 2.2: CNN

### 2.5.7 SVM Algorithm

Support Vector Machine or SVM is one of the most popular Supervised Learning algorithms, which is used for Classification as well as Regression problems. However, primarily, it is used for Classification problems in Machine Learning. The goal of the SVM algorithm is to create the best line or decision boundary that can segregate n-dimensional space into classes so that we can easily put the new data point in the correct category in the future. This best decision boundary is called a hyperplane.

SVM chooses the extreme points/vectors that help in creating the hyperplane. These extreme cases are called as support vectors, and hence algorithm is termed as Support Vector Machine. Consider the below diagram in which there are two different categories that are classified using a decision boundary or hyperplane:

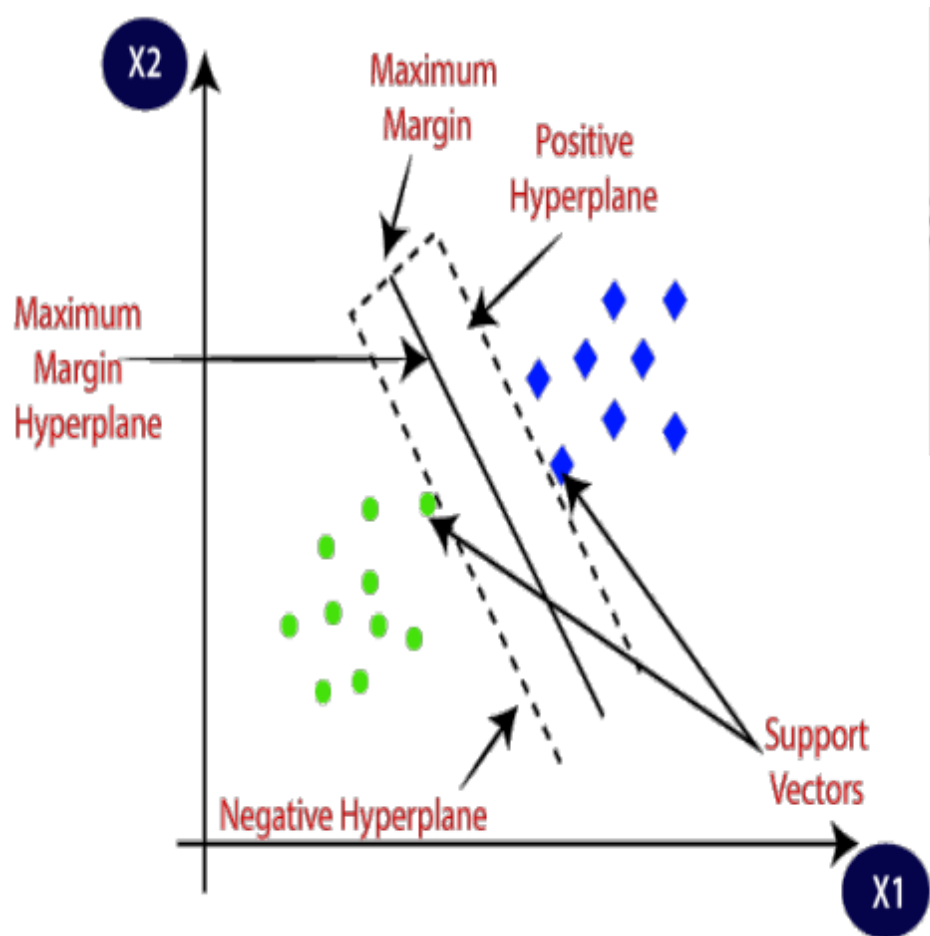


Figure 2.3: SVM

### 2.5.8 Malaria Blood Sample Diseases Dataset

This dataset contains Images of malaria infected blood sample and non infected blood sample. This dataset contains 100 jpg images The images are grouped into 2 classes There are 50 images in each class.

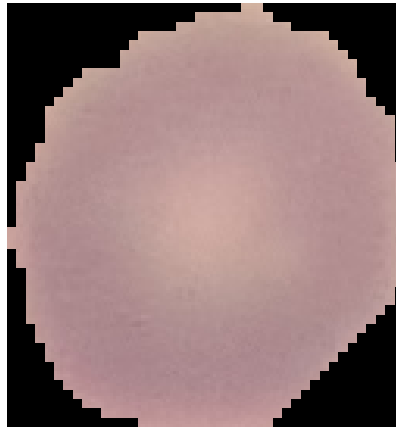


Figure 2.4: Negative



Figure 2.5: Positive

### 2.5.9 GIT- Version Control

- **Version Control System**

A version control system (VCS) allows you to track the history of a collection of files. It supports creating different versions of this collection. Each version captures a snapshot of the files at a certain point in time and the VCS allows you to switch between these versions. These versions are stored in a specific place, typically called a repository.

- **Localized and Centralized VCS**

A localized version control system keeps local copies of the files. This approach can be as simple as creating a manual copy of the relevant files. A centralized version control system provides a server software component which stores and manages the different versions of the files. A developer can copy (checkout) a certain version from the central sever onto their individual computer.Both approaches have the drawback that they have one single point of failure. In a localized version control systems it is the individual computer and in a centralized version control systems it is the server machine. Both system makes it also harder to work in parallel on different features.

- **Distributed VCS**

In a distributed version control system each user has a complete local copy of a repository on his individual computer. The user can copy an existing repository.This copying process is typically called cloning and the resulting repository can be referred to as a clone.Every clone contains the full history of the collection of files and a cloned repository has the same functionality as the original repository.

- **Git**

Git is currently the most popular implementation of a distributed version control system.Git originates from the Linux kernel development and was founded in 2005 by Linus Torvalds. Nowadays it is used by many popular open source projects, e.g., the Android or the Eclipse developer teams, as well as many commercial organizations.The core of Git was originally written in the programming language C, but Git has also been re-implemented in other languages, e.g., Java, Ruby and Python.



## 2.6 About the Back End

### 2.6.1 Database Servers

A database server is used to store data in a database. Users can access the data and manipulate it. There are many types of databases. The most popular among them is the Relational Database Management System (RDBMS).

### 2.6.2 RDBMS

RDBMS is a type of database management system that stores data in the form of related tables. Relational database are powerful because they require few assumptions about how data is related or how it will be extracted from the database. As a result, the same database can be viewed in many different ways. An important feature of relational systems is that a single database can be spread across several tables. This differs from flat file database, in which each database is self-contained in a single table.

### 2.6.3 MySQL

MySQL is based on a client-server model. The core of MySQL is MySQL server, which handles all of the database instructions (or commands). MySQL server is available as a separate program for use in a client-server networked environment and as a library that can be embedded (or linked) into separate applications. MySQL operates along with several utility programs which support the administration of MySQL databases. Commands are sent to MySQL Server via the MySQL client, which is installed on a computer. MySQL was originally developed to handle large databases quickly. Although MySQL is typically installed on only one machine, it is able to send the database to multiple locations, as users are able to access it via different MySQL client interfaces. These interfaces send SQL statements to the server and then display the results.

The required software includes the MySQL clients and a MySQL server. The client program must be located on the machine where you will working. The server can be located on our machine although that is not required. As long as you have permission to connect to it the server can be located anywhere. In addition to the MySQL software you will need a MySQL account so that the server will allow you to connect and create us sample database and its table. Microsoft SQL Server 2008 is a full-featured relational database management system (RDBMS) that offers a variety of administrative tools to ease the burdens of database development, maintenance and administration. In this article, we'll cover six of the more frequently used tools: Enterprise Manager, Query analyzer, SQL Profiler, Service Manager, Data Transformation Services and Books Online. Let's take a brief look at each:

### 2.6.4 Features of MySQL

- Relational Database Management System (RDBMS): MySQL is a relational database management system.
- Easy to use MySQL is easy to use. You have to get only the basic knowledge of SQL. You can build and interact with MySQL with only a few simple SQL statements.
- It is secure: MySQL consist of a solid data security layer that protects sensitive data from intruders. Passwords are encrypted in MySQL.
- Client/ Server Architecture: MySQL follows a client /server architecture. There is a database server (MySQL) and arbitrarily many clients (application programs), which communicate with the server; that is, they query data, save changes, etc.
- Client/ Server Architecture: MySQL follows a client /server architecture. There is a database server (MySQL) and arbitrarily many clients (application programs), which communicate with the server; that is, they query data, save changes, etc.
- Allows roll-back: MySQL allows transactions to be rolled back, commit and crash recovery.
- High Performance: MySQL is faster, more reliable and cheaper because of its unique storage engine architecture.
- Flexibility: MySQL supports a large number of embedded applications which makes MySQL very flexible.
- High Productivity: MySQL uses Triggers, Stored procedures and views which allows the developer to give a higher productivity.

MySQL enables data to be stored and accessed across multiple storage engines, including Inorb, CSV, and NDB. MySQL is also capable of replicating data and partitioning tables for better performance and durability. MySQL users aren't required to learn new commands; they can access their data using standard SQL commands. Before 2016, the main difference between MySQL and SQL was that the former could be used on multiple platforms, whereas the latter could only be used on Windows. Microsoft has since expanded SQL to support Linux, a change which went into effect in 2017. When MySQL is installed via Linux, its package management system requires custom configuration to adjust security and optimization settings. MySQL also allows users to choose the most effective storage engine for any given table, as the program can utilize multiple storage engines for individual tables. One of MySQL's engines is Inorb. Inorb was designed for high availability. Because of this, it is not as quick as other engines. SQL uses its own storage system, but it does maintain multiple safeguards against loss of data. Both systems are able to run in clusters for high availability. SQL Server offers a

wide variety of data analysis and reporting tools. SQL Server Reporting Services is the most popular one and is available as a free download. There are similar analysis tools for MySQL available from third-party software companies, such as Crystal Reports XI and Actuate BIRT.

## **2.7 Requirement Specification**

### **2.7.1 Software Requirement**

The software requirements specification (SRS) is a means of translating the ideas in the minds of clients into a formal documentation. This document forms the development and software validation. The basic reason for the difficulty in software requirement specification comes from the fact that there are three interested parties—the client, the end users and the software developer. The requirements document has to be such that the client and the user can understand easily and the developers can use it as a basis for software development. Due to the diverse parties involved in software requirement specification, a communication gap exists. This gap arises when the client does not understand software or the software development processor when the developer does not understand the client's problem and application area. SRS bridges this communication gap.

Problem analysis is done to obtain a clear understanding of the needs of the clients and the users, and what exactly is desired from the software. Analysis leads to the actual specification. People performing the analysis called analysts, are also responsible for specifying the requirements. The software project is initiated by the client's needs. In the beginning these needs are in the minds of various people in the client organization. The requirement analyst has to identify their requirements by talking to these people and understanding their needs. These people and the existing documents about the current mode of operation are the basic source of information for the analyst.

### **2.7.2 Hardware Requirement**

Requirements analysis is the process of determining user expectations for a new or modified product. These features, called requirements, must be quantifiable, relevant and detailed. This step acquiring all the facts problem specification such as identifying the desired result determining what information is needed to produce these results and figuring out what process must be carried out to proceed to get the accurate result.

## 2.8 Software and Hardware Specification

### 2.8.1 Software Specification

Operating system	Windows 10
Application framework	Anaconda 5.2.0
Front end	Html, CSS
Back end	Python, <del>php</del>
Text editor	Notepad++

Figure 2.6: software requirement

### 2.8.2 Hardware Specification

Processor	intel core i3 8th generation or above
Hard Disk	5GB or above
Mouse	Standard
Keyboard	Standard
Monitor	15 VGA Color
RAM	8 GB or more

Figure 2.7: hardware specification

## **3 SYSTEM MODELLING**

### **3.1 Design Methodology**

Design methodology refers to the development of a system or method for a unique situation . Today the term is most often applied to technological fields in reference to web design, software or information system design. The key design methodology is finding the best solution for each design situation, whether it be in industrial design, architecture or technology. Design methodology stresses the use of brainstorming to encourage innovative ideas and collaborative thinking to work through each proposed idea and arrive at the best solution. Meeting the needs and wants of the end user is the most critical concern. Design methodology also employs basic research methods, such as analysis and testing.

### 3.2 Use case diagram

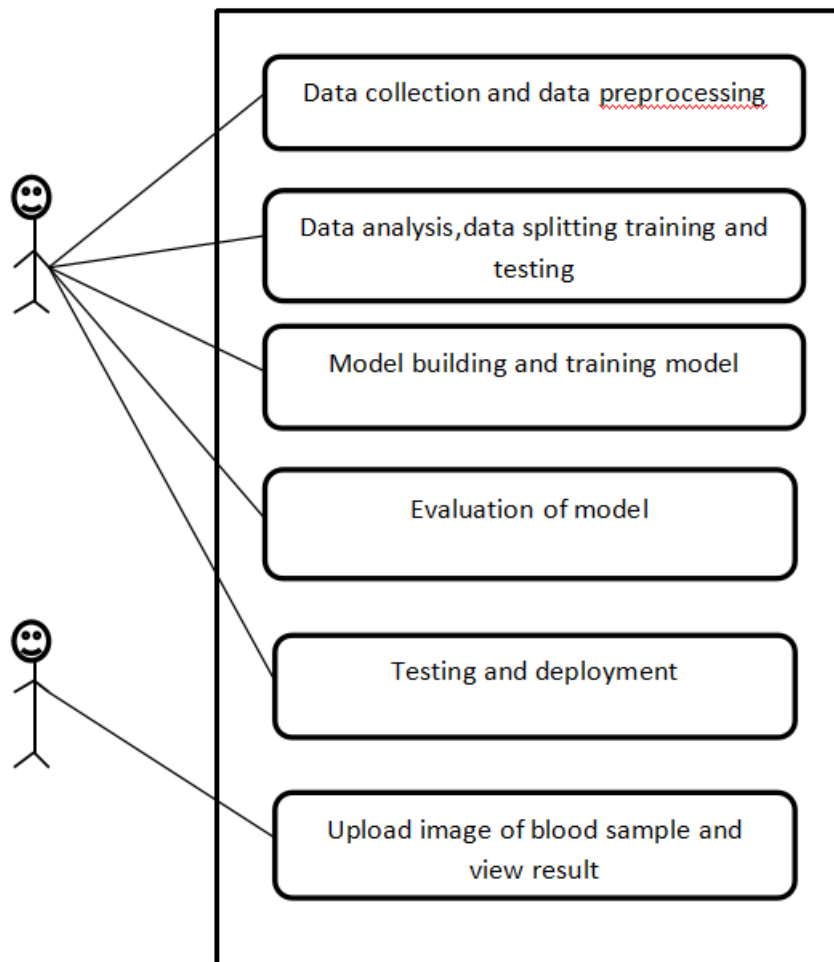


Figure 3.1: Use Case Diagram

### 3.3 UML Diagram

#### 3.3.1 Activity Diagram



Figure 3.2: Activity Diagram

### 3.4 Table Description

This project consists of following tables: **Search Table**

Table 3.1: login

Field name	Data type	Constraints
id	integer	Primary Key
name	varchar(20)	Not null
email	varchar(20)	Not null
password	varchar(20)	Not null



## 4 SYSTEM DESIGN

System design is the first step in the development phase for any engineering product or system. The term “Design” is defined as “The process of principles for the purpose of defining a processor a system insufficient detail to permit its realization”. And design is most creative and challenging phase of system development life cycle. It is an approach for the creation of the proposed system is designed, which will help in the system coding. System design is vital for efficient database management. It provides the understanding of procedural details necessary for implementing the system. A number of sub- systems are to be identified which constitute the whole system.

System design high-end decisions are taken regarding the basic system architecture, platforms and tools to be used. The system design transforms a logical representation of what a given system is required to be in the physical specification. It is an approach for the creation of the proposed system is designed, which will help in the system coding. Design starts with system requirement specification and converts it to a physical reality during the development. Important design fact or such as reliability, response time, throughput of the system maintainability, expand-ability etc. should be taken into account.

System design is the process of developing specifications for the proposed system that meet the needs established in the structured analysis. A major step in the structured design is the preparation of input and output design which will be acceptable to the user. Structured design is the process of planning a new system to replace the old one. Characteristics of well-defined system is:

- (1)Acceptability
- (2)Decision making ability
- (3)Economy
- (4)Flexibility
- (5)Reliability
- (6)Simplicity

### 4.1 Module Descriptions

#### 4.1.1 User-Module

Tasks performed by user are:

- Upload image - Users can upload image of blood sample
- View - They can view the result

## **4.2 Input Design**

Input design converts user-oriented inputs to computer- based format, which requires careful attention. The collection of input data is the most expensive part of the system in terms of the equipment used and the number of people involved. In input design, data is accepted for computer processing and input to the system is done through mapping via some map support or links. The input screens need to be designed very carefully and logically. A set of menus is provided which help for better application navigation. While entering data in the input forms, proper validation checks are done and messages will be generated by the system if incorrect data has been entered.

## **4.3 Output Design**

Outputs are the most important a direct source of information to the user and to the department. Intelligent output design will improve the systems relationship with the user and help much indecision-making. Outputs are so used to provide a permanent hard copy of the results for later uses. The forms used in the system are shown in the appendix. Computer output is the most important and direct source of information the user. Efficient, intelligible output design should improve the systems relationship with the user and help in decision making

## **4.4 User Interface Design**

User interface design or user interface engineering is the design of user interfaces for machines and software, such as computers, home appliances, mobile devices, and other electronic devices, with the focus on maximizing usability and the user experience. The goal of user interface design is to make the user's interaction as simple and efficient as possible, in terms of accomplishing user goals. Good user interface design facilitates finishing the task at hand without drawing unnecessary attention to itself. Graphic design and typography are utilized to support its usability, influencing how the user performs certain interactions and improving the aesthetic appeal of the design; design aesthetics may enhance or detract from the ability of users to use the functions of the interface. The design process must balance technical functionality and visual elements to create a system that is not only operational but also usable and adaptable to changing user needs.

## 5 AGILE TECHNOLOGY OVERVIEW

### 5.1 Introduction To Scrum

Scrum is a subset of agile. Scrum is a framework within which people can address complex adaptive problems, while productively and creatively delivering products of the highest possible value. Scrum itself is a simple framework for effective team collaboration on complex products. Scrum co-creators Ken Schwaber and Jeff Sutherland have written The Scrum Guide to explain Scrum clearly and succinctly. This Guide contains the definition of Scrum.

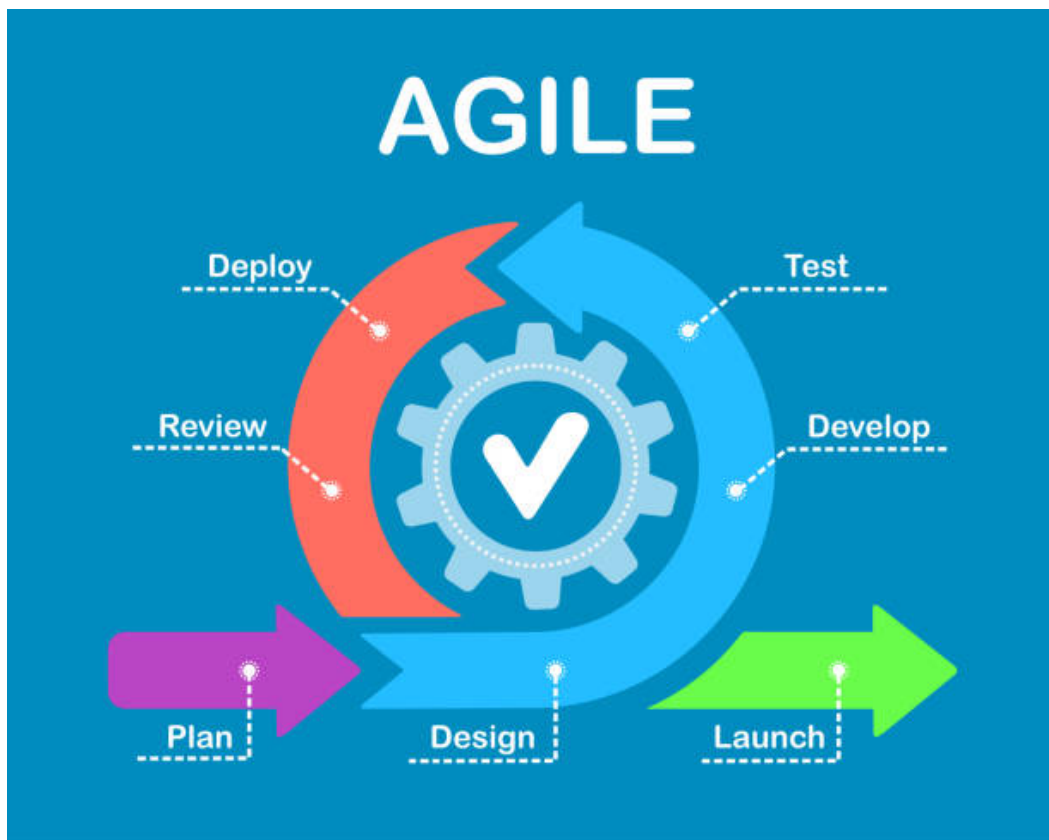


Figure 5.1: Project Planning

## 5.2 Principles Or Methodology Used

The SCRUM methodology is defined by team rules, events (ceremonies), artifacts and roles.

### 5.2.1 Scrum Team

A scrum team is a collection of individuals (typically between five and nine members) working together to deliver the requested and committed product increments. To work effectively it is important for a scrum team that everyone within the team follow a common goal. The Scrum Team share different tasks and responsibilities related to the delivery of the product. Each role are closely inter-related. It is recommended for Scrum team members work together in the same location whenever possible. There are 3 roles in a scrum team:

1. **The Product Owner:** The product owner is a project's key stakeholder—Usually an internal or external customer or a scope person for the customer. There is only one product owner who conveys the overall mission and vision of the product which the team is building. The product owner is ultimately accountable for managing the product backlog and accepting completed increments of work.
2. **The Scrum Master:** The scrum master is the servant leader to the product owner, development team and organization. With no hierarchical authority over the team but rather more of a facilitator, The scrum master ensures that the team adheres to scrum theory, practices and rules. The scrum master protect the team by doing anything possible to help the team perform of the highest level. This may include removing impediments, facilitating meetings and helping the product owner groom the backlog.
3. **The Development Team:** is a self organizing, cross functional group armed with all of the skills to deliver shippable increments at the completion of each sprint.

### 5.2.2 Scrum Events

Scrum events are time-boxed events that means in a project, every scrum events has a predefined maximum duration. These events enable transparency on the project progress to all who are involved in the projects. The vital events of scrum are -the Sprint.

1. **The Sprint:** A sprint is a time-boxed period during which specific work is completed and made ready for review. Sprint are usually 2-4 weeks long but can be as short as 1 week .
2. **Sprint Planning:** Sprint Planning team meetings are time-boxed events that determine which product backlog items will be delivered and have the work will be achieved.

3. **The daily Stand-up:** The daily stand-up is a short communication meeting in which each team member quickly and transparently covers progress since the last stand-up ,planed work before the next meeting and any impediments that may be blocking his or her progress.
4. **The Sprint Review:** The sprint review is the "show and tell" of demonstration events for the team to present the work completed during the sprint.The product owner checks the work against predefined acceptance criteria or either accept or reject the work.The stakeholder or client give feedback to ensure that the deliverd incremental must the business model.
5. **Retrospective:** The retrospective or retro is the final team meeting in the sprint to determine what went well,what didn't go well and how the team can improve the next sprint. Attended by the team and the scrum master,the retrospective is an important opportunity for the team to focus on its overall performance and identify stratgies for continous improvement on its process.

### 5.2.3 Scrum Artifacts

Scrum artifacts are designed to increase transparency of information related to the delivery of the project, and provide opportunities for inspection and adaptation.They are management products useful for the creation of the specialist product of the project. There are 3 artifacts in scrum

1. **Product Backlog** An extended list of everything that might be needed in the final product.
2. **Sprint Backlog** Selected items for the product backlog to be delivered through a sprint,along with the task for delivering the item and realizing the sprint goal.
3. **The Sprint Review** Increment set of all the product backlog items so far in the project.

### 5.2.4 Scrum Rules

The rules of Agile Scrum Should be completely up to the team and governed for what works best for their processes.The best agile will tell teams to start with basic scrum events listed above and then inspect and adopt based on your teams unique needs so there is continuous improvement in the way teams work together.

## 5.3 Sprint

### 5.3.1 Product Backlog

In the simplest definition the Scrum Product Backlog is simply a list of all things that needs to be done within the project. It replaces the traditional requirements specification artifacts. These items can have a technical nature or can be user centric e.g. in the form of user stories.Product Backlog refinement is the act of adding detail, estimates, and order to items in the Product Backlog. This is an

ongoing process in which the Product Owner and the development Team collaborate on the details of Product Backlog items. A Scrum product backlog contains descriptions of the functionality desired in an end product. Agile backlog prioritization is the next step.

The Product Backlog is the tool used by the product owner to keep track of all of the features that stakeholders would like to see implemented in the product whereas the Sprint Backlog is a subset of the Product Backlog representing the current active Sprint iteration. However, the product owner prioritizes it.

Feature_id	User Story	Priority	Estimation hrs.
1	Data collection and <u>pre-processing</u> data	High	60
2	Splitting data and feature extraction	High	60
3	Model building and training model	High	60
4	Evaluating and testing model	High	60
5	Upload image and view result	High	60

Figure 5.2: Product backlog

### 5.3.2 Sprint Planner

Sprint Planning is time-boxed to a maximum of eight hours for a one-month Sprint. For shorter Sprints, the event is usually shorter. The Scrum Master ensures that the event takes place and that attendants understand its purpose. The Scrum Master teaches the Scrum Team to keep it within the time-box. The Sprint Goal is an objective set for the Sprint that can be met through the implementation of Product Backlog. It provides guidance to the Development Team on why it is building the Increment. It is created during the Sprint Planning meeting. The Sprint Goal gives the Development Team some flexibility regarding the functionality implemented within the Sprint. As the Development Team works, it does so with the Sprint Goal always in mind.

Sprint Planner (Whole Project)						
Feature ID	Sprint	Start date	End Date	Duration (Days)	Estimation (Hrs)	Sprint Goal
1	1	25/04/22	06/05/22	10	60	1.1 - Data Collection 1.2 - Preprocessing Data
2	2	09/05/22	20/05/22	10	60	2.1 - Splitting Data 2.2 - Feature Extraction
3	3	23/05/22	03/06/22	10	60	3.1 - Model Building 3.2 - Model training 3.3 - Identify best algorithm
4	4	06/06/22	17/06/22	10	60	4.1 - Evaluating Model 4.2 - Testing Model
5	5	20/06/22	01/07/22	10	60	5.1 - Upload Values 5.2 - Display the results

Figure 5.3: Sprint planner

### 5.3.3 Ideal Burn Down Chart

A burndown chart is a graphical representation of the work remaining for a project and the time remaining to complete it. Burndown charts are commonly used in software development, especially in teams using Agile project management. Here we have 48 working hours and 12 weeks to complete the project. The quantity of work remaining is shown on a vertical axis, while the time that has passed since beginning the project is placed horizontally on the chart, which shows the past and the future. The burndown chart is displayed so everyone on the team can see it and is updated regularly to keep it accurate.

There are two variants that exist for a burndown chart. A sprint burndown is for work remaining in the iteration. When illustrating the work remaining for the entire project, the chart is called a product burndown. The burndown chart has several points. There's an x-axis, which is the project or iteration timeline. The y-axis is the work that needs to get done in the project. The story point estimates for the work that remains is represented by this axis. The project starting point is the farthest point to the left of the chart and occurs on day zero of the project or iteration. The project end point is farthest to the right and marks the final day of the project or iteration.

There is an ideal work remaining line, which is a straight line connecting the start point to the end point. It shows the sum of the estimates for all the tasks that need to be completed. At the end point, the ideal line crosses the x-axis and shows there is no work left to be done. This line is based on estimates and therefore not always accurate.

Then there is the actual work remaining line that shows the actual work that remains in the project or iteration. At the beginning the actual work remaining and the ideal work remaining are the same, but



as the project or iteration progresses the actual work line will fluctuate above and below the ideal work line. Each day a new point is added to this line until the project or iteration is done to make sure it's as accurate as possible. If the actual work line is above the ideal work line, it means there is more work left than originally thought. In other words, the project is behind schedule. However, if the actual work line is below the ideal work line, there is less work left than had been predicted and the project is ahead of schedule.

#### **5.3.4 Git Hub Registration**

GitHub is an online-browser based distributed version control system for software developers using the Git revision control system. The service provides free public repositories, issue tracking, graphs, code review, downloads, wikis, collaborator management, and more. GitHub offers free accounts for users and organizations working on public and open source projects, as well as paid accounts that offer unlimited private repositories and optional user management and security features. Git hub account creation includes the following steps:

- Go to the GitHub sign up page, then Enter a username, valid email address, and password. Use at least one lowercase letter, one numeral, and seven characters.
- Review carefully the GitHub Terms of Service and Privacy Policy before continuing and Choose a plan. Hereby anyone can finish the account creation procedure.
- You can store a variety of projects in GitHub repositories, including open source projects.
- In the upper-right corner of any page, click , and then click New repository.
- Type a short, memorable name for your repository followed by Optionally, add a description of your repository, public or private repository.
- Select Initialize this repository with a README. finally Click Create repository.
- After creation, need to collaborate members by the admin.
- In the left sidebar, click Collaborators and teams.
- Under "Collaborators", type the name of the person you'd like to give access to the repository, then click Add collaborator.
- Next to the new collaborators name, choose the appropriate permission level: Write, Read, or Admin.
- The user will receive an email inviting them to the repository. Once they accept your invitation, they will have collaborator access to your repository.

## 6 CODING

### 6.1 Coding Standards Followed

During the development of the application I follow standard python coding. Python uses indentation to give you a visual indication of the structure of our code. Additionally we have an interactive interpreter which provides a default representation for many objects and data structures.

The Python programming language has evolved over the past year as one of the most favourite programming languages. This language is relatively easy to learn than most of the programming languages. It is a multi-paradigm, it has lots of open source modules that add up the utility of the language.

**Indentation:** When programming in Python, indentation is something that you will definitely use. However, you should be careful with it, as it can lead to syntax errors. The recommendation is therefore to use 4 spaces for indentation. And also this for loop with print statement is indented with 4 spaces.

**Imports:** Importing libraries and/or modules is something that you'll often do when you're working with Python for data science.

**Comments:** Comments are used for in code documentation in Python. Comments start with the symbol `#`. Anything written after the hashtag does not get executed by the interpreter. You write documentation strings or doc-strings at the start of public modules, files, classes and methods. These type of comments start with `"""` and end with `"""`.

**Maximum Line Length:** Generally, it's good to aim for a line length of 79 characters in your Python code. It is possible to open files side by side to compare. You can view the whole expression without scrolling horizontally which adds to better readability and understanding of the code.

### 6.2 Error Handling

An exception is an event, which occurs during the execution of a program that disrupts the normal flow of the program's instructions. In general, when a Python script encounters a situation that it cannot cope with, it raises an exception. An exception is a Python object that represents an error. When a Python script raises an exception, it must either handle the exception immediately otherwise it terminates and quits. The try and except block in Python is used to catch and handle exceptions. Python executes code following the try statement as a "normal" part of the program. The code that follows the except statement is the program's response to any exceptions in the preceding try clause. If you have some

suspicious code that may raise an exception, you can defend your program by placing the suspicious code in a `try:` block. After the `try:` block, include an `except:` statement, followed by a block of code which handles the problem as elegantly as possible.

**Syntax:** Here is simple syntax of try and except block

```
try :  
    // Code  
except :  
    // Code
```

Here are few important points about the above-mentioned syntax:

- A single try statement can have multiple except statements. This is useful when the try block contains statements that may throw different types of exceptions.
- You can also provide a generic except clause, which handles any exception.
- After the except clause(s), you can include an else-clause. The code in the else-block executes if the code in the try: block does not raise an exception.
- The else-block is a good place for code that does not need the try: block's protection.

## 7 CODE REVIEW AND TESTING

### 7.1 Code Review

Software Testing is the process of executing a program or system with the intent of finding errors. Testing involves any activity aimed at evaluating an attribute or capability of a program or system and determining that it meets its required results. coding is done very well it tested in this project.

Testing Objectives include:

- Testing is a process of executing a program with the intent of finding an error.
- A good test case is one that has a probability of finding an as yet undiscovered error.
- A successful test is one that uncovers an undiscovered error.

Testing Principles are:

- All tests should be traceable to end user requirements
- Tests should be planned long before testing begins
- Testing should begin on a small scale and progress towards testing in large
- Exhaustive testing is not possible
- To be most effective testing should be conducted by an independent third party.

Implementation is the stage of the project where the theoretical design is turned into a working system. At this stage the main workload, the greatest upheaval and the major impact on the existing system shifts to the user department. If the implementation is not carefully planned and controlled it can cause chaos and confusion. The implementation stage involves the following tasks :

- Careful planning.
- Investigation of system and constraints. of methods to achieve the changeover.
- Training of staff in the changeover phase.
- Evaluation of the changeover method.

The method of implementation and the time scale to be adopted are found out initially. Next the system is tested properly and the same time users are trained in the new procedures.

## 7.2 Testing Process

Testing helps not only to uncover errors introduced during coding, but also locates errors committed during the previous phases. Thus the aim of testing is to uncover requirements, design or coding errors in the program. Software Testing is a critical element of software quality assurance and represents the ultimate review of specification, design and coding. Testing presents interesting anomalies for the software engineer.

### Unit testing

This is the first of testing. In this different modules are tested against the specification produced during the design of the modules. It refers to the verification of single program module in an isolated environment. Unit testing focuses on the modules independently of one another to locate errors.

In our project we test each module and each form individually. Each form may be tested using appropriate values. The input screens need to be designed very carefully and logically. While entering data in the input forms, proper validation checks are done and messages will be generated by the system if incorrect data has been entered.

### Validation Checks

As a web application developer, form validation is a crucial part of your work, and it should not be underrated as it could lead to security flaws in your application. You should consider it a must if you're striving to provide a professional end user experience.

- Basic form validation
- Custom error messages

I always prefer to load common libraries and helpers in the constructor of the controller itself as it's a nice habit to avoid code duplication elsewhere in controller methods. We load the form and url helpers so that we can use the utility methods provided by those helpers throughout the rest of the application. The form validation library in the constructor, you can access it using the form validation convention.

## **8 SYSTEM SECURITY MEASURES**

### **8.1 Database/Data Security**

Nowadays, databases any web based application by enabling websites to provide varying dynamic content. Since very sensitive or secret information can be stored in a database, you should strongly consider protecting your databases. Database security refers to the collective measures used to protect and secure a database or database management software from illegitimate use and malicious threats and attacks. It is a broad term that includes a multitude of processes, tools and methodologies that ensure security within a database environment.

To retrieve or to store any information you need to connect to the database, send a legitimate query, fetch the result, and close the connection. Nowadays, the commonly used query language in this interaction is the Structured Query Language (SQL). In this project we use sqlite 3 for database storage. By default, a SQLite database does not require user authentication (no-authentication-required database). After you created a user, the database will be marked as requiring authentication (authentication-required database). Then, user need to provide username and password when connecting to the database file.

### **8.2 Creation of User Profiles And Access Rights**

Profile Learning Model starts with identifying the user status; if the user uses the system for the first time, he enters his personal data and this data is registered in the User Id List. after user login to the system successfully, he should enter a query that describes his preference. Then, a domain thesaurus is employed for mapping the domain keywords found in the query to the corresponding domain concepts. terms of the proposed domain thesaurus are arranged into separate clusters; each cluster consists of a set of synonyms and represents a specific concept. For each cluster, one preferred term is chosen to represent the underlying concept; the other terms are non-preferred terms . The proposed domain thesaurus considers only the Synonym relation, which specify terms that express the same concept.

Therefore, a Preference List is constructed. This list contains the extracted domain concept from Virtual Document entered by the user. The Multi-class Classifier is then used to classify the query into one of the domain hypotheses. Therefore, the user profile database will be constructed. Document classification has a good impact in the overall system performance as it simplifies the matchmaking among the users preferences and those multi classified documents stored in the systems database during the recommendation process. If the user accepts the recommendation results the process is then completed.

## 9 IMPLEMENTATION

After the system has been tested, the implementation type or the change over technique from the existing system to the new system is a step-by-step process. In the system at first only a module of the system is implemented and checked for suitability and efficiency. When the end user related to the particular module is satisfied with the performance, the next step of implementation is preceded.

Implementation to some extent is also parallel. For instance, modules which are not linked, with other modules are implemented parallel and the training is the step-by-step process. Backups are necessary since any time unexpected events may happen. And so during the program execution, the records are stored in the workspace. This helps to recover the original status of the records from any accidental updating or intentional deletion of records

### 9.1 New System Description

Malaria is one of the severe diseases caused by the protozoan parasites of the genus *Plasmodium*, transmitted via female *Anopheles* mosquito. During the process of complex life cycle of parasites in growing and reproducing inside the human body, the red blood cell (RBCs) are used as hosts and destroyed afterwards. World Health Organization estimates that in 2015 mentioning in their website <http://www.who.int/en/>, 212 million clinical cases of malaria occurred, and 429,000 people died of malaria, most of them children in Africa. Also as malaria causes so much illness and death, the disease hampers on many national economies and WHO also discovers that many countries with malaria are already among the poorer nations it is difficult for them to break the a vicious cycle of disease and poverty. Normally malaria happened because of four types of plasmodium species called *Plasmodium falciparum*, *Plasmodium vivax*, *Plasmodium ovale*, *Plasmodium malariae*. The web application entitled detection of malaria parasite using image processing is focuses on detecting malaria disease. we developed a model by using color based pixel discrimination technique and Segmentation operation to identify malaria parasites from thin smear blood images. Various segmentation techniques like watershed segmentation, HSV segmentation have been used in this method to decrease the false result in the area of malaria detection. We believe that, our malaria parasite detection method will be helpful wherever it is difficult to find the expert in microscopic analysis of blood report and also limits the human error while detecting the presence of parasites in the blood sample.

### 9.2 New System Implementation

An Implementation plan is a management tool for a specific policy measure, or package of measures, designed to assist agencies to manage and monitor implementation effectively. Implementation plans are intended to be scalable and flexible; reflecting the degree of urgency, innovation, complexity

or sensitivity associated with the particular policy measure. The implementation stage involves following tasks:

- Careful planning
- Investigation of system and constraints
- Design of method to achieve the changeover phase.
- Evaluation of the changeover method

Import the required libraries for building the model. Import Keras for developing and evolution of deep learning models and the dataset will be imported. Here, also import some layers, some Keras library like dense, dropout, Conv2D, Maxpooling2D. After importing the dataset, the first step is pre-processing. In preprocessing we are going to split the dataset into training and testing sets. Now we are going to design neural network model using CNN algorithm with the help of Keras. First step is initializing the sequential model. In this model we are having convolutional layers, in first convolutional layer we have 2 Conv2D layers with 64 neurons, kernel size 4,4, Activation function is Relu. The process starts with the initialization of model accompanied by batch normalization layer followed by different convolutional layers with activation function ReLu. The derivative of ReLu function will be either 0 or 1 so, there will be some difference in the weight updation so, our gradient descent converges. Finally the input image will be among one of the class.



## **10 CONCLUSION**

### **10.1 Future Enhancement**

In future the model can be extended for detecting all type of diseases occur in human being. Data gathered from these environments show that the model can be used to perform inference under 1 s per sample in both offline (mobile only) and online (web application) mode. These inference speeds coupled with the high classification accuracy lead us to believe that this work can play a part towards building a fully automated system for malaria parasite detection which may be useful in resource-constrained areas in the foreseeable future.

### **10.2 Conclusions**

Since the detection of malaria parasites is done by pathologists manually using microscopes, the chances of false detection due to human error are high, which in turn can result into fatal condition. Considering this fact in mind we proposed a method which curbs the human error while detecting the presence of malaria parasites in the blood sample by using image processing. We achieved this goal using image segmentation smoothing processing techniques to detect malaria parasites in images acquired from giemsa stained peripheral blood samples. The real samples collected from diagnostic centre provide better result than collected images from internet because the images from diagnostic centre contain similar color intensity and other image quality where internet images vary in quality. For future work, classification process can be introduced for more accurate and automated detection of malaria parasite. And we also hope that if we want to apply image processing in any other detection in blood sample this study will help a lot as a pioneer.

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## 12 APPENDIX

### 12.1 BurnDown Chart

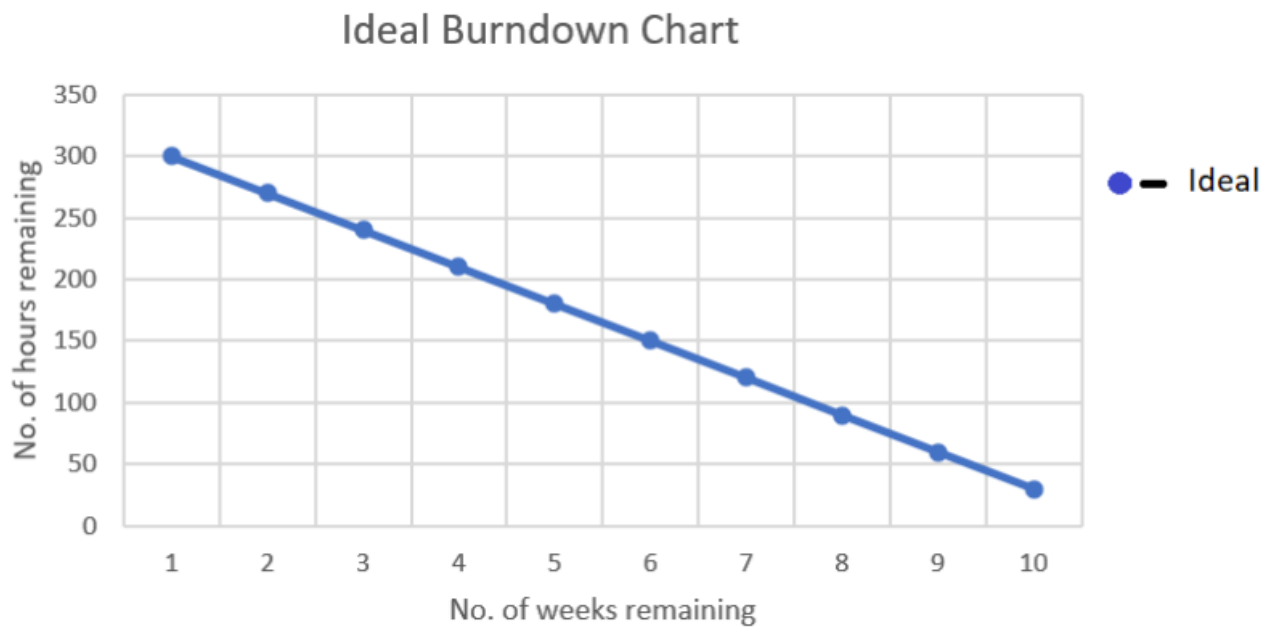


Figure 12.1: Burndown chart

## 12.2 GitHub Registration

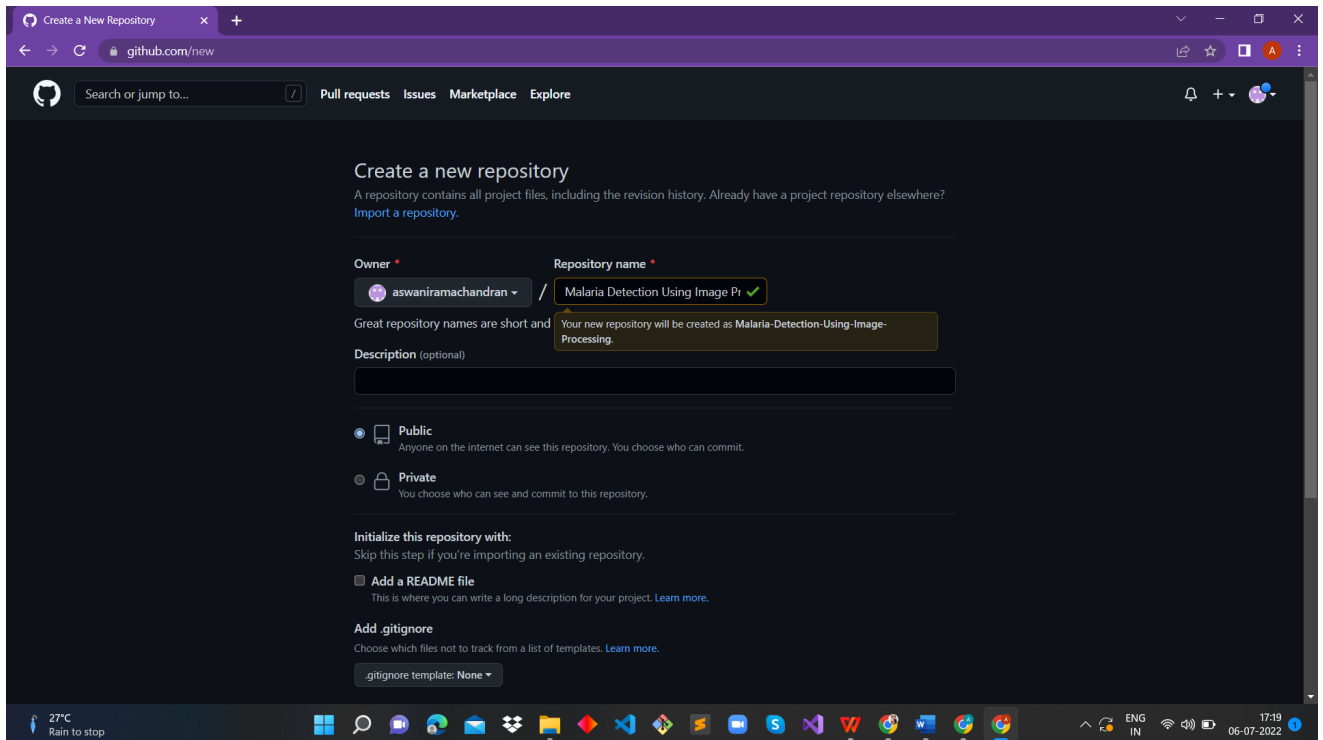


Figure 12.2: creation of repository

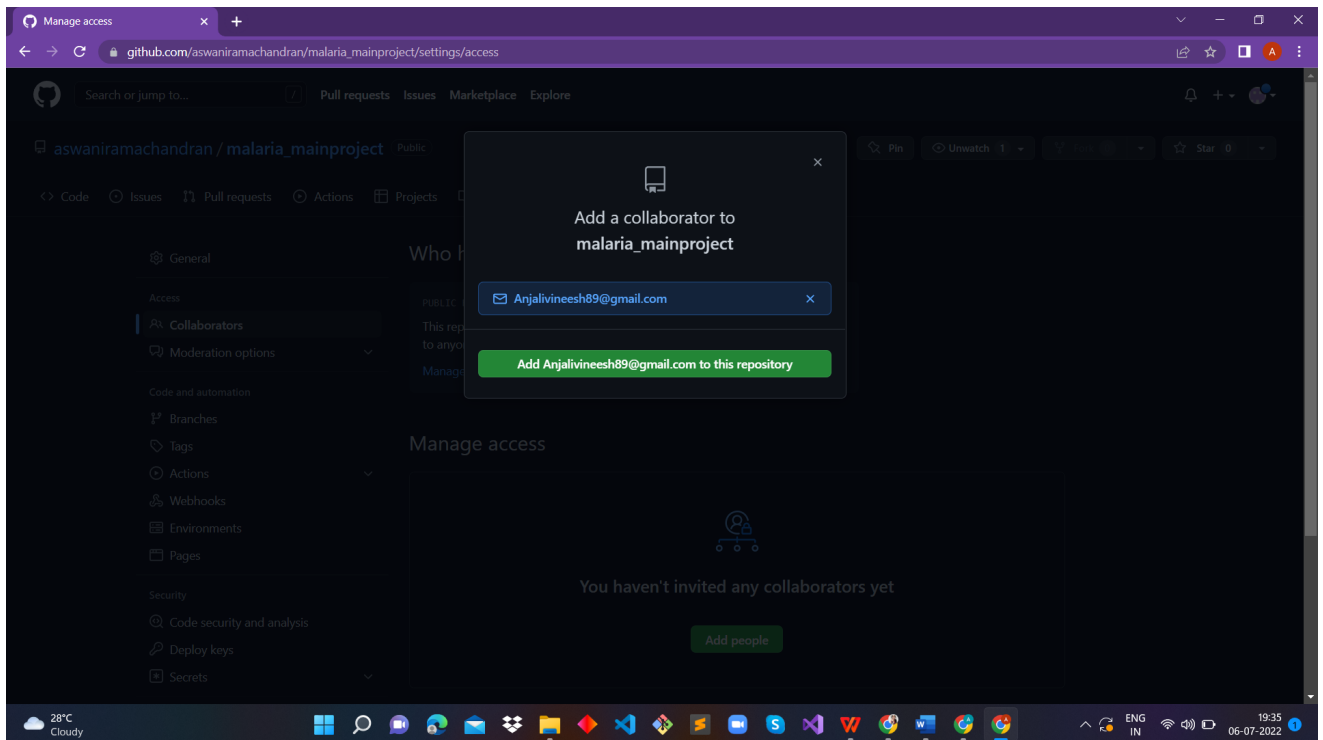


Figure 12.3: Adding Collaborator

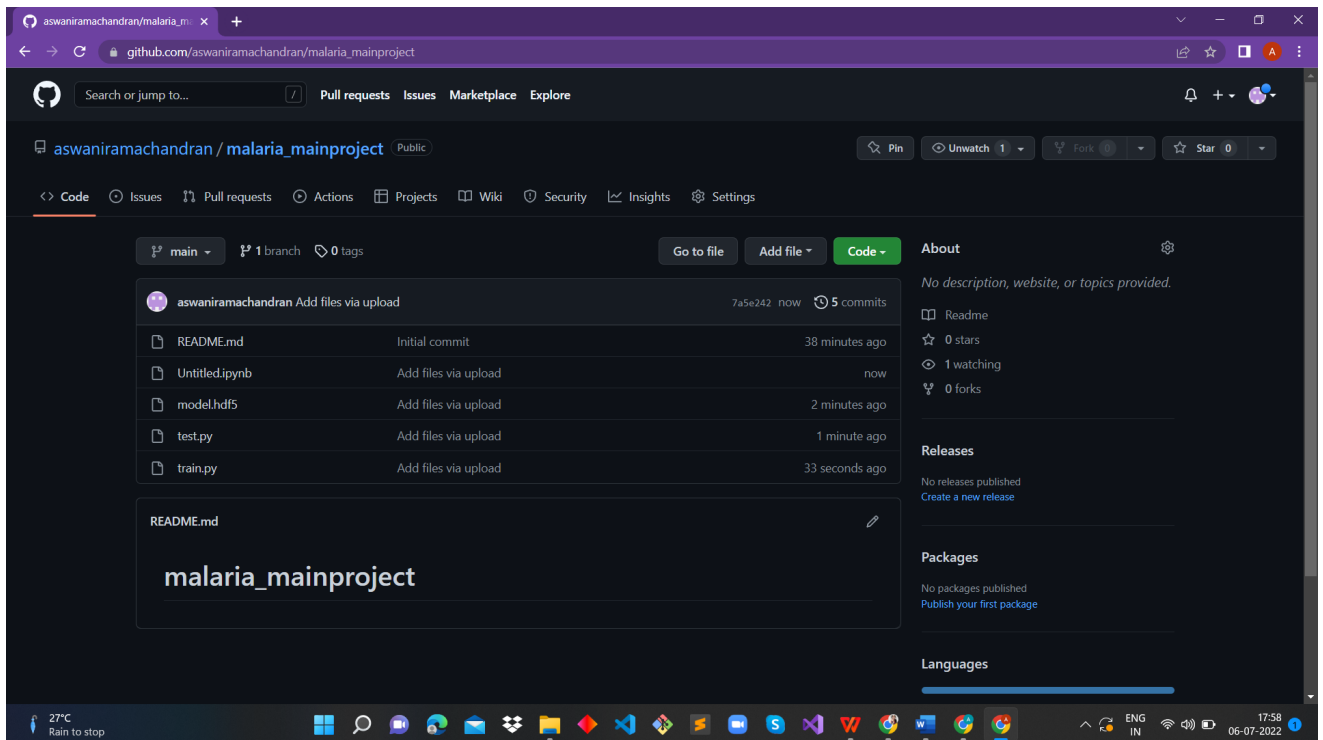


Figure 12.4: Initial Project Structure

## 12.3 Screen Shots of Forms

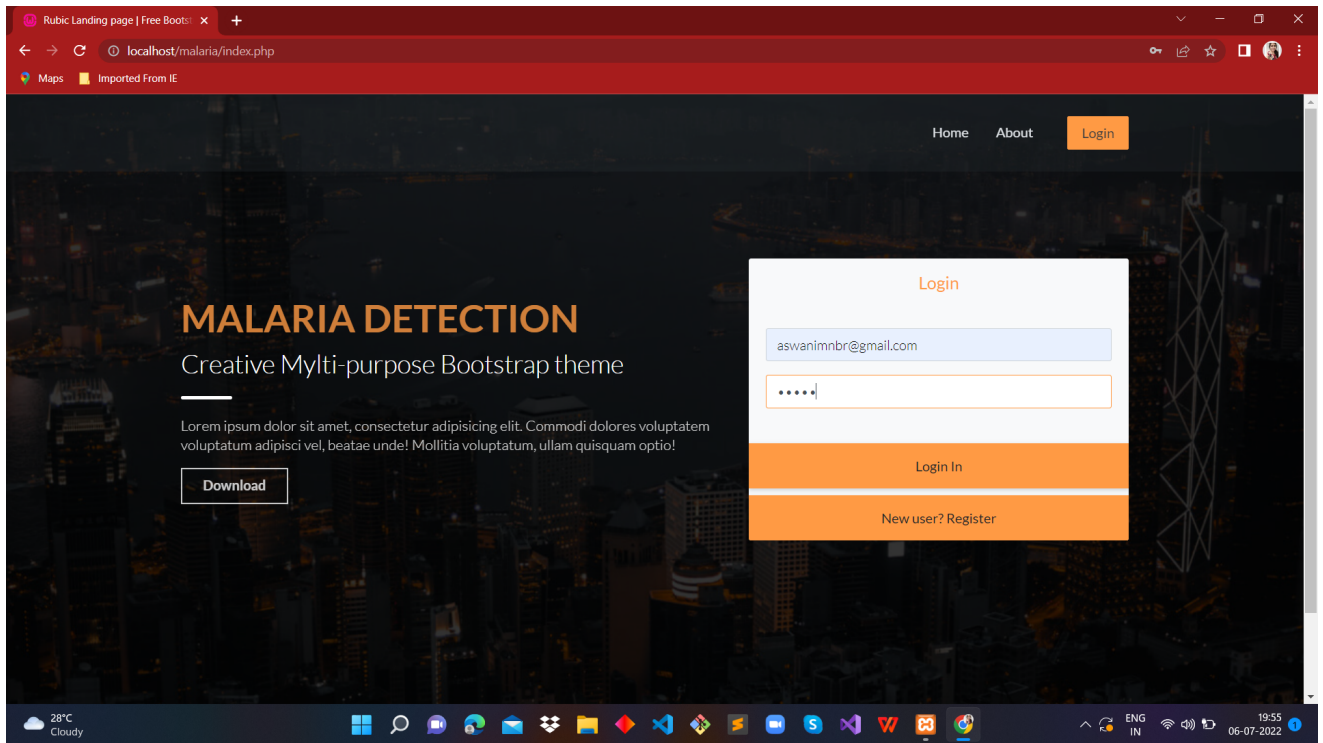


Figure 12.5: Home Page

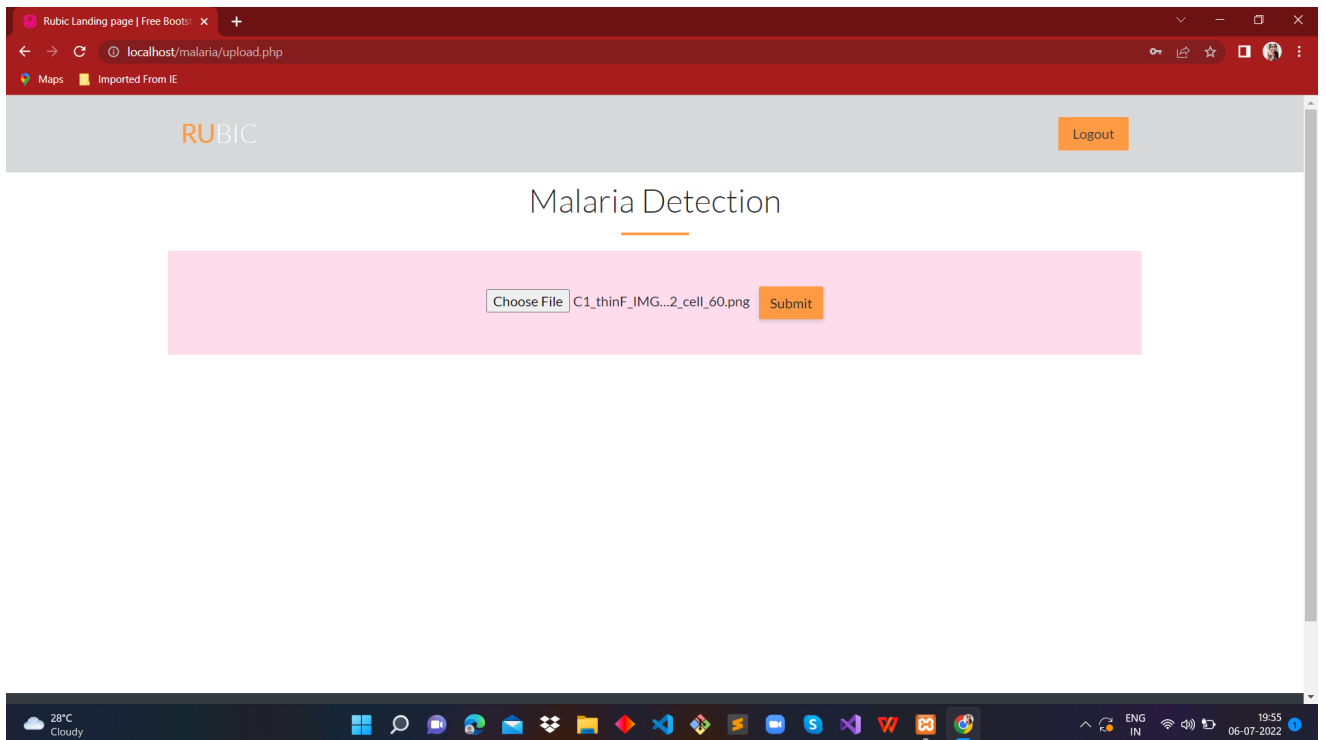


Figure 12.6: Upload Image



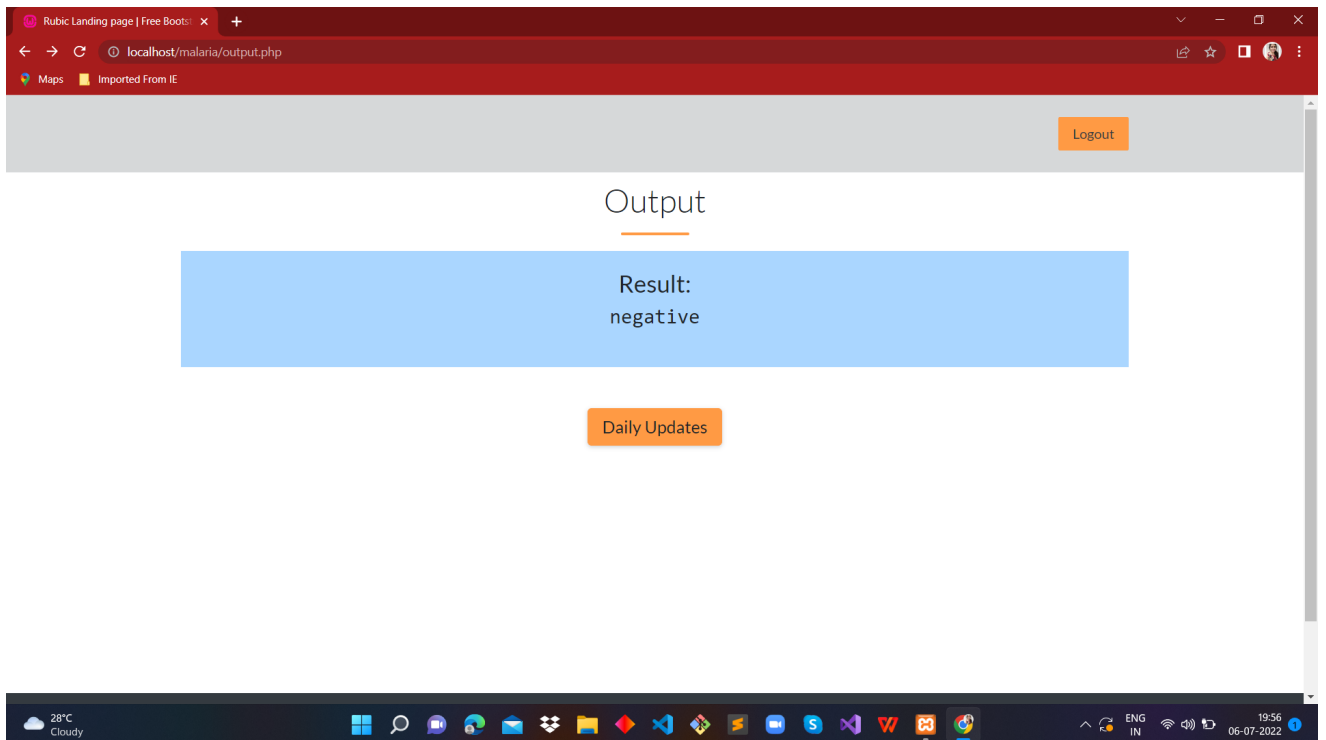


Figure 12.7: View result

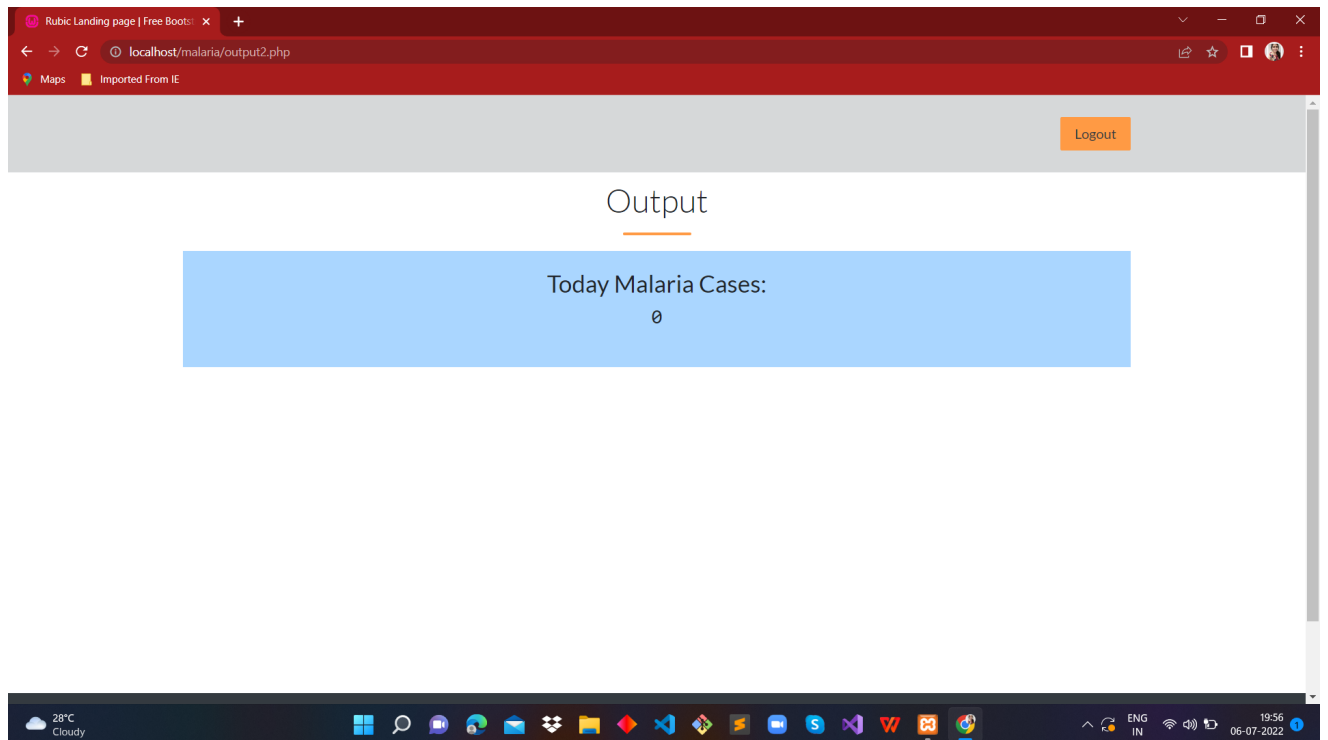
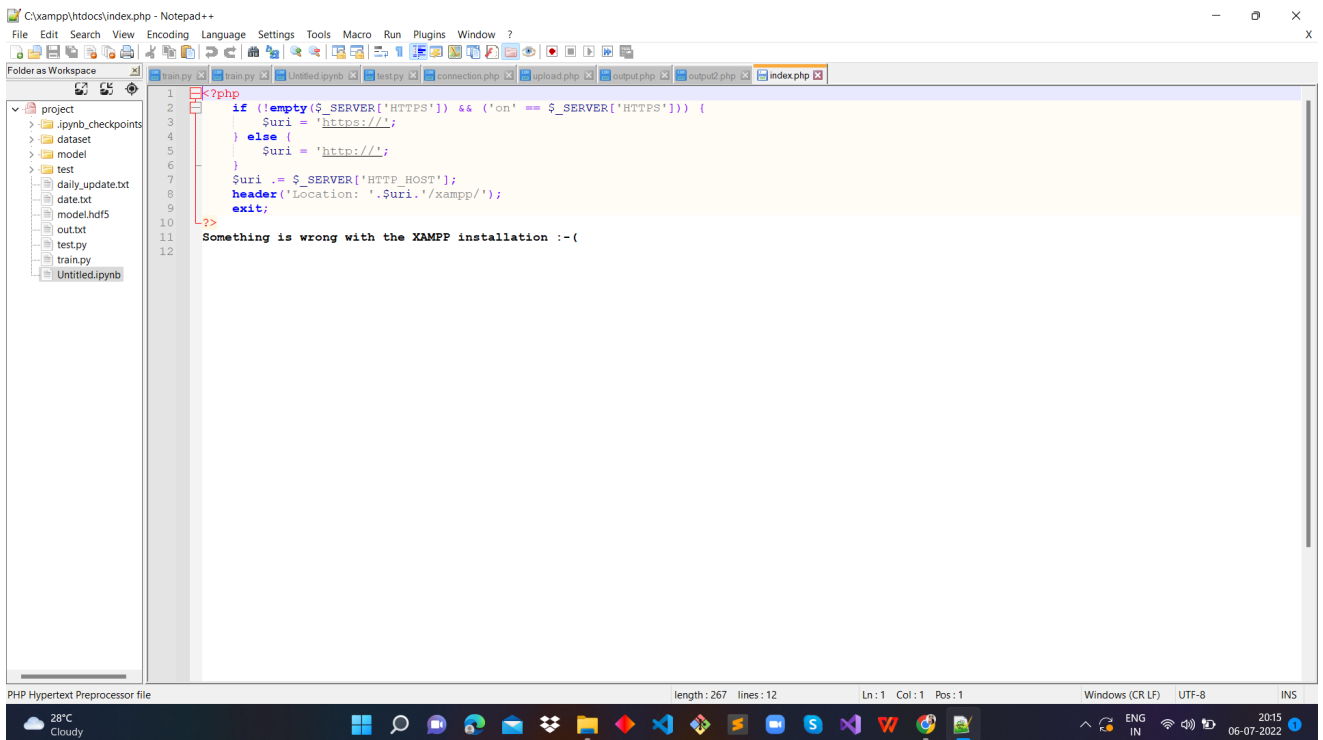


Figure 12.8: View daily update

## 12.4 Sample Code



```
1 <?php
2 if (!empty($_SERVER['HTTPS']) && ('on' == $_SERVER['HTTPS'])) {
3     $uri = 'https://';
4 } else {
5     $uri = 'http://';
6 }
7 $uri .= $_SERVER['HTTP_HOST'];
8 header('Location: '.$uri.'/xampp/');
9 exit;
10
11 Something is wrong with the XAMPP installation :-(
12
```

Figure 12.9: PHP code

```

1
2
3
4 #model building use cheyyunna libraries
5
6 import keras
7 from keras.layers import Conv2D,MaxPooling2D,Flatten,Dense,Dropout
8 from keras.models import Sequential
9 from keras import optimizers
10 from keras import regularizers
11 from keras.layers.normalization import BatchNormalization
12 #model building
13 #convolution layer adding
14 #Filtersize(64) (kernelsize 4,4)
15 def cnnsvm():
16     #sequential function(model variable vechu)
17     model=Sequential()
18     #layers adding
19     model.add(Conv2D(64,kernel_size=(4,4),activation="relu",input_shape=(200,150,3)))
20     model.add(BatchNormalization())
21     model.add(MaxPooling2D(pool_size=(2,4)))
22     #svm non linear regularizer function implementation using cnn
23     model.add(Conv2D(64,kernel_size=(3,5),activation="relu",kernel_regularizer=regularizers.l2(0.04)))
24     model.add(MaxPooling2D(pool_size=(2,2)))
25     model.add(Dropout(0.2))
26     model.add(Conv2D(64,kernel_size=(3,5),activation="relu"))
27     model.add(MaxPooling2D(pool_size=(2,2)))
28     model.add(Dropout(0.2))
29     model.add(Flatten())
30     #input layer il ninu output ayitt ethra values vennam ennanu(hidden layer) using ANN (Neruron)
31     model.add(Dense(128,activation="relu",kernel_regularizer=regularizers.l2(0.02)))
32     model.add(Dropout(0.1))
33     model.add(Dense(64,activation="relu",kernel_regularizer=regularizers.l2(0.02)))
34     model.add(Dropout(0.1))
35     model.add(Dense(32,activation="relu"))
36     model.add(Dropout(0.1))
37     model.add(Dense(2,activation="softmax"))
38     #loss function used specify the datatype(catagorical anno continues anno)
39     # metrix vechitt model evaluate cheyyunne
40     model.compile(loss=keras.losses.categorical_crossentropy,optimizer=optimizers.Adam(lr=0.0001,beta_1=0.9,beta_2=0.9,epsilon=1e-8,decay=0.0),met

```

Figure 12.10: Python code

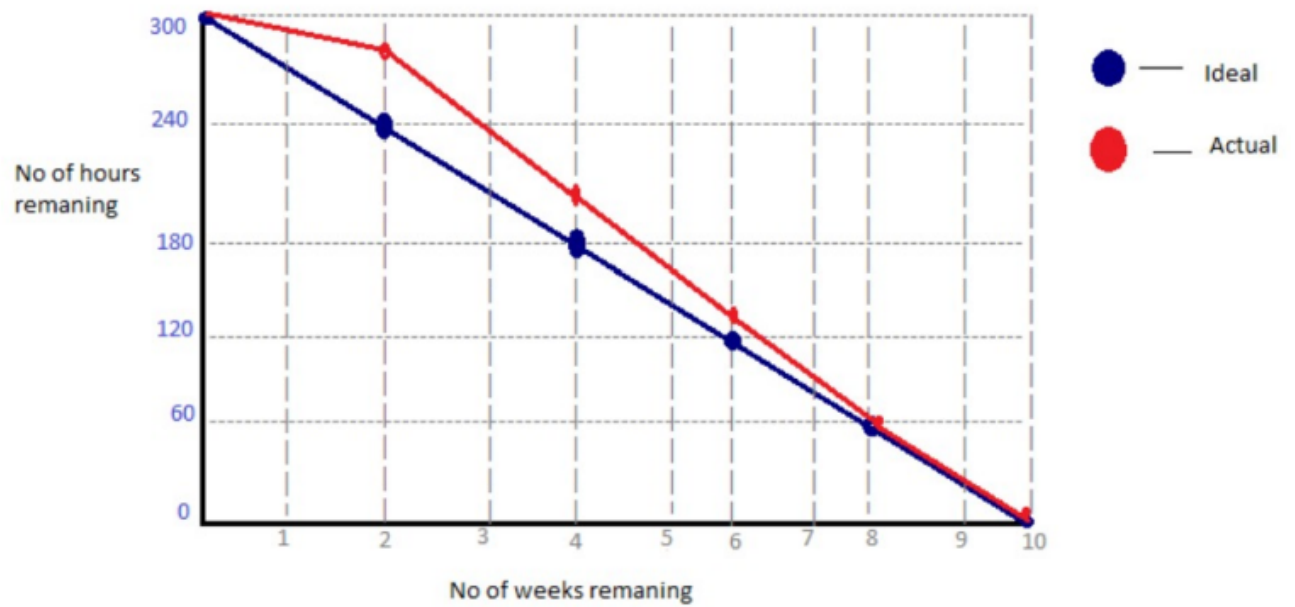


Figure 12.11: Actual BurnDown Chart