AI BASED LOCALIZATION AND CLASSIFICATION OF SKIN DISEASE WITH ERYTHEMA

Team ID	PTN2022TMID47686
Project Name	AI based localization and classification of skin disease with erthyma

ABSTRACT

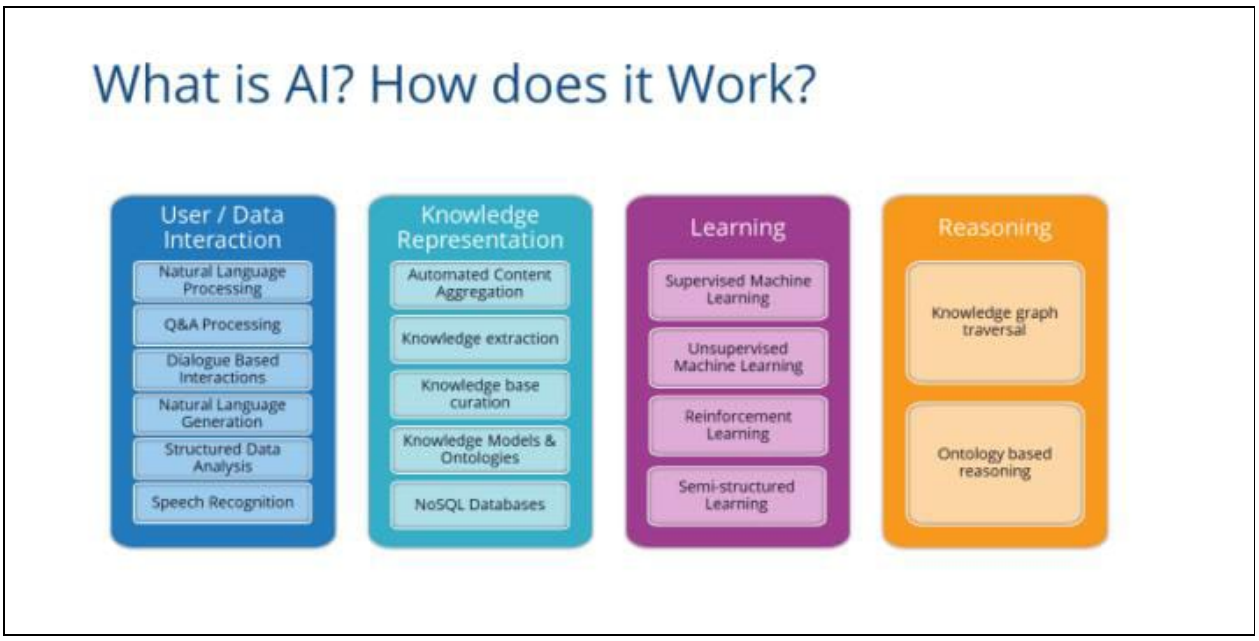
Nowadays people are suffering from skin disease more than 125 million people suffering from psoriasis also skin cancer rate is rapidly increasing over the last few decades especially melanoma is most diversifying skin cancer. If skin diseases are not treated at an early stage then it may lead to complications in the body including spreading of the infection from one individual to others. The skin image is diversified so that it is a challenging job to devise an efficient and robust algorithm for automatic detection of skin disease and its severity.

CONTENT

1.INTRODUCTION

In the simplest terms, AI which stands for artificial intelligence refers to systems or machines that mimic human intelligence to perform tasks and can iteratively improve themselves based on the information they collect. AI manifests in a number of forms.

HOW DOES IT WORK



1.1 PROJECT OVERVIEW

People suffering from Psoriasis also skin cancer. If skin diseases are not treated at an earlier stage, then it may lead to complications in the body including spreading of the infection from one individual to the other. The skin diseases can be prevented by investigating the infected region at an early stage. The characteristic of the skin images is diversified so that it is a challenging job to devise an efficient and robust algorithm for automatic detection of skin disease

and its severity. Skin tone and skin color play an important role in skin disease detection. Color and coarseness of skin are visually different. Automatic processing of such images for skin analysis requires quantitative discriminator to differentiate the diseases.

1.2 PURPOSE

To overcome the above problem we are building a model which is used for the prevention and early detection of skin cancer, psoriasis. Basically, skin disease diagnosis depends on the different characteristics like colour, shape, texture etc. Here the person can capture the images of skin and then the image will be sent the trained model. The model analyses the image and detect whether the person is having skin disease or not.

2.LITERATURE SURVEY

Amarathunga et al . [1] havecome up with The system consists of two separateunits namely ; data processing and Image processing unit . The data processing unit was responsible for image acquisition , preprocessing for noise removal, segmentation and feature extraction from the skin disease images whereas data processing unit was employedfor data mining task or classification.

Chakraborty et al . [2] have proposed a hybrid model using multi objective optimization algorithm NSGA K IIand ANN for diagnosis of skin lesion being benign or malignant. The bag of K features approach

is appliedto classify the skin lesionsand are generated using SIFT . SIFT algorithm identifies and locates the keypoints from the input image and generates the feature vector . Also , to handle large number of keypoints k means clustering algorithm was used to get representative keypoints where each clustercontains some representative keypoints and these are the generated bag K of K features .

Estevez et al . [3] were first to report about how the image classifier convolutional neural netwok (CNN) can achievethe performance similar to the 21 board K certified dermatologists for identification of malignant lesions . The 3 K waydisease partition algorithm was designed to classify a given skin lesion to be malignant , benign or non K neoplastic . Also , 9 K way disease partition was performed to classify a given lesioninto one of the 9 mentioned categories . The state K of K the art InceptionV3 CNN architecture was used for skin lesion classification [3] has concluded that the CNN can outperform human experts if it is trained with enough data . Also , [4] has concluded that the CNN can outperform human experts if it is trained with enough data .

Chatterjeeet al . [4] for identification of skin lesion being benign or malignant. The malignant lesions are further classified into subcategories namely ; melanocytic or epidermal skin lesions . The cross correlation techniqueis used to extract regionalfeatures which are invariant to light intensityand illumination changes. Also , the cross spectrum based frequency domainanalysis has been used for retrieving more detailed featuresof skin lesions . For classification the SVM classifierwas used with three non K linear kernels[4] out of whichSVM with RBF kernel gave promising accuracyas compared to other kernels .

Zhang et al. [5] also used InceptionV3 architecture with modified final layer to classify 4 diseases. The model was trained on two

nearlysimilar datasets of dermoscopic images.Authors [5] concludedthat misclassification can occur due to presenceof multiple diseaselesions on the single skin image.

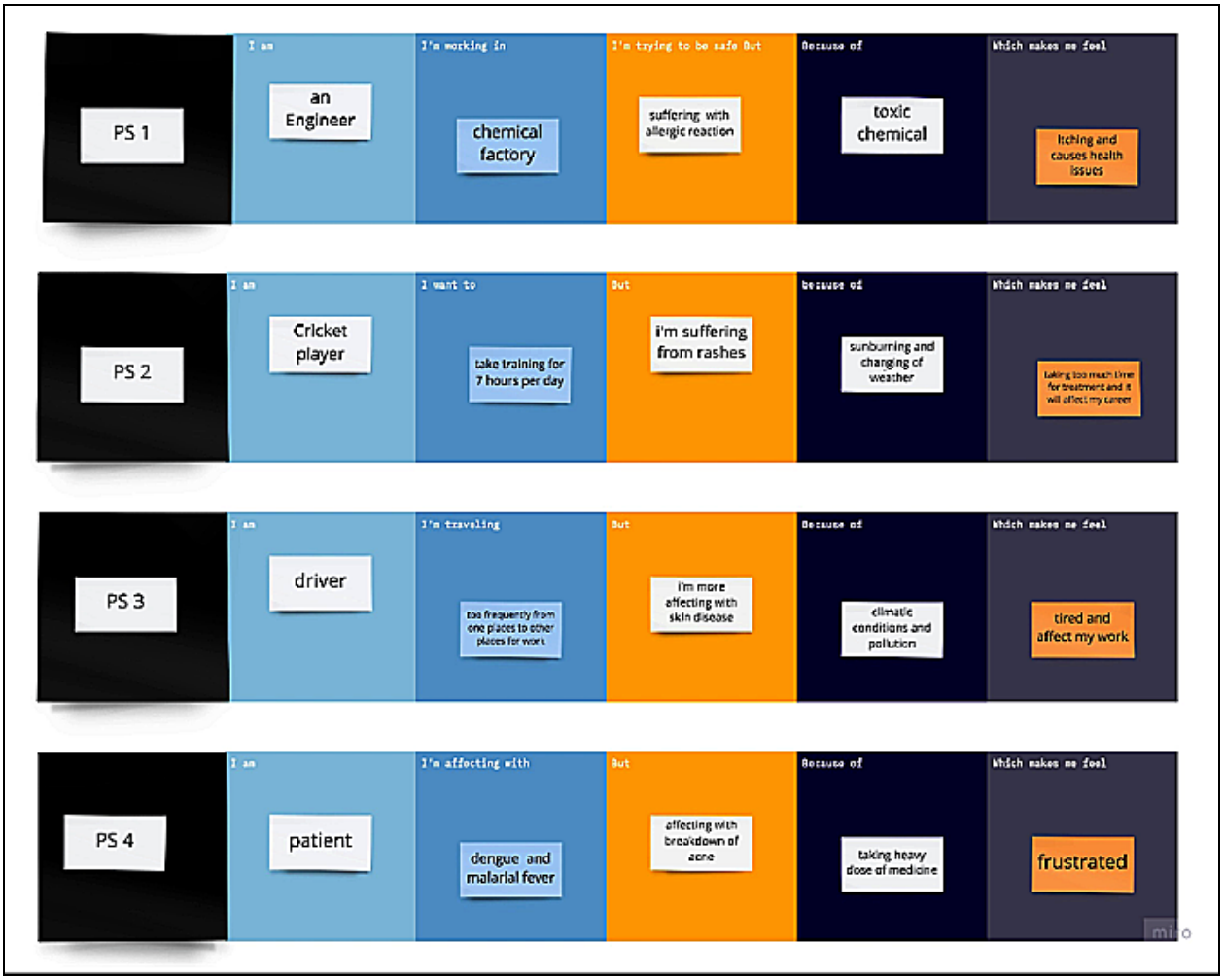
Sun et al. [6] haveproposed handcrafted featurebased as well as CNN based approaches for classification of clinical images.They trained four CNN architectures namely;Caffenet, fineK tuned Caffenet, VGG and fineKtunedVGGNet. Out of these four the fineKtunedVGGNet gave quite good accuracy.The accuracy of VGGNet was similar to that of the handcrafted feature which was generated by 7 different methods namely; SIFT and color histogram with SVM classifier. However, the architectures and use of benchmark dataset plays an important role for skin disease image classification to achieve good accuracy.

Gessert et al. [7] introduced patch based method to obtain fineKgrain differences between various skin lesions from high resolution images. The high resolution imagesare divided into 5, 9, and 16 crops or patches and these images patches or crops are fed to the standardCNN architectures. Threearchitectures were used by the authors namely;Inception v3, DenseNetand SEKResnext50 architecture [7] for prediction of disease from high resolutionimage patch.

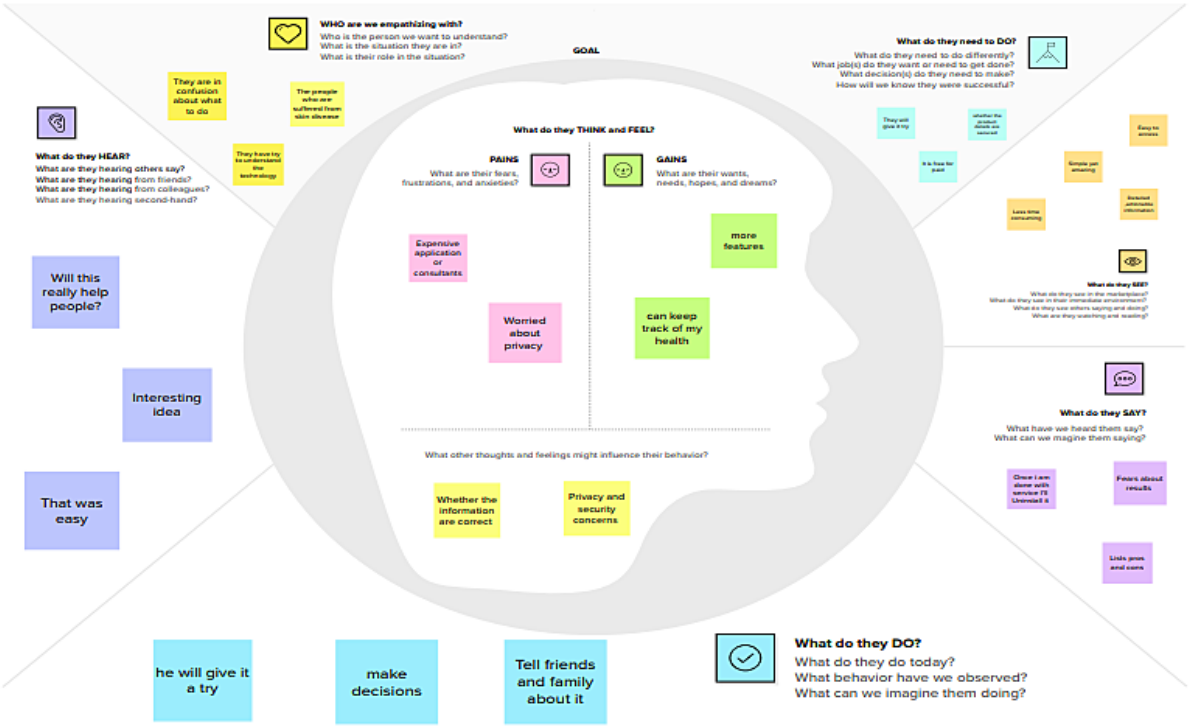
Rehman et al. [8] haveproposed CNN architecture by setting 16 different filtersof 7*7 kernel size with pooling layers for down sampling. The proposed model was trainedfor malignant and benign categoryof diseases namely;melanoma, Seborrheic keratosisand nevus. The RGB channelsof the segmented image are normalized with zero mean and unitvariance. This normalized matrix was fed to CNN for feature extraction, furtherthe fully connected layer consists of 3 layerANN classifier which classify the skin lesion being banign or malignant.

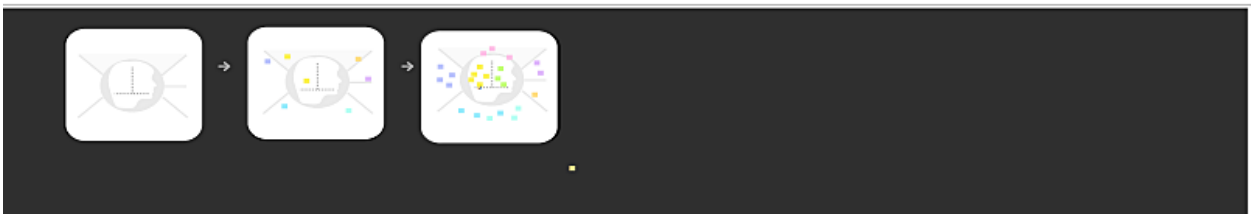
2.3 IDEATION PHASE -DEFINE THE PROBLEM STATEMENT

Customer problem statement:



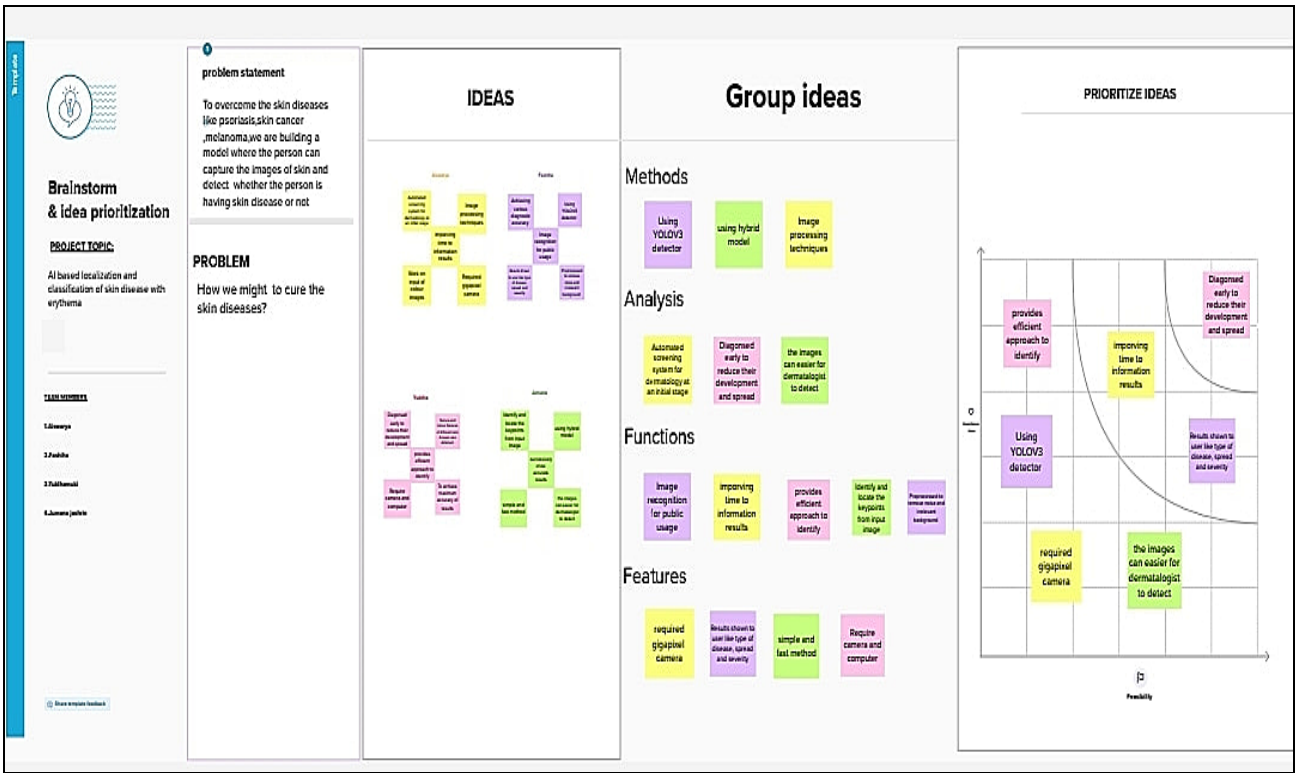
3. IDEATION PHASE- EMPATHIZE & DISCOVER





3.2 IDEATION PHASE-BRAINSTORM & IDEA PRIORITIZATION TEMPLATE

Brainstorm & Idea prioritization:



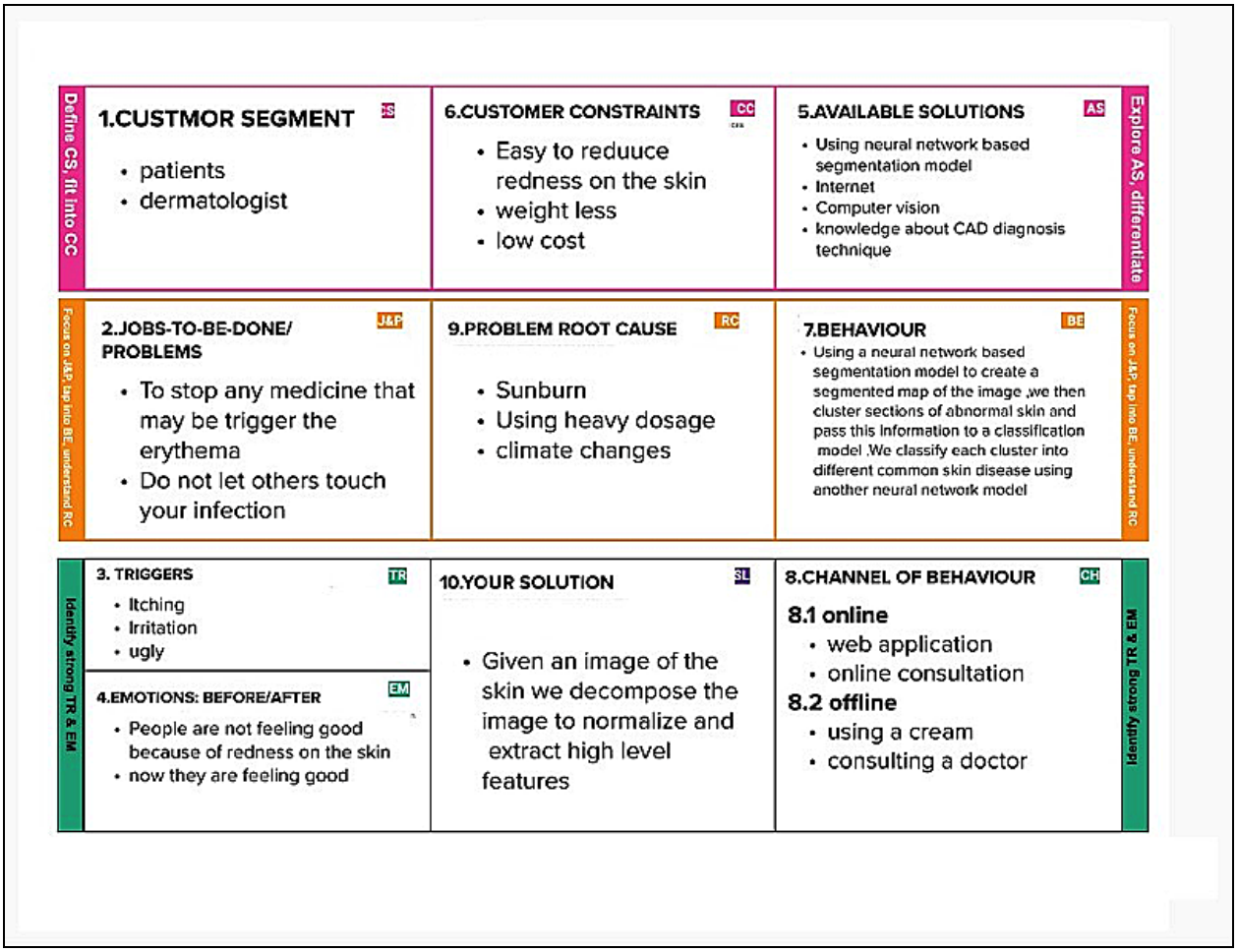
3.3 PROJECT DESIGN PHASE 1 -PROPOSED SOLUTION

proposed solution:

S.NO	PARAMETER	DESCRIPTION
1.	Problem Statements (problem to be solved)	Skin disorders are among the most common diseases in both developing and industrialized countries. People living with skin disease experience stressful life as skin disease affects their confidence and self-esteem in so many different ways.
2.	Idea / Solution description	Create YOLO object detector helps the dermatologist. Medical imaging plays a important role for quick decision making in skin disease identification. Medical imaging is used for revealing internal structures hidden by the skin as well as to diagnoseand treat disease.
3.	Novelty / uniqueness	The novelty of the work is that the system automatically helpsthe dermatologist by detecting the disease just by images or videos, when immediate attention is required for the patient during

		treatment.
4.	Social impact / Customer Satisfaction	Make the patient more assure about their safety. We have classification model which is more accurate than a baseline model trained without segmentation, while also being able to classify multiple diseases within a single image. This improved performance may be sufficient to use CAD in the field of dermatology.
5.	Business model (Revenue model)	● Able to get accurate results ● Easy to use ● Patient can use this detector by their own ● Low cost
6.	Scalability of the solution	● This model ensures the safety and accuracy of the detection results of skin disease. ● Patient and their family need not to be worried about the treating and healing time.

3.4 PROJECT DESIGN PHASE I-PROBLEM SOLUTION FI



4. PROJECT DESIGN PHASE II SOLUTION REQUIREMENTS (FUNCTIONAL & NON FUNCTIONAL)

4.1 Functional Requirements:

FR NO	Functional Requirement (Epic)	Sub Requirement (story)
FR-1	Application building	➢ Build HTML page for login, Registration, Prediction, Log out. ➢ YOLOV3 detector is real time object detection algorithm specify the objects in image. ➢ Computer vision can gain high understanding of images.
FR-2	User registration	➢ Registration through Gmail. ➢ Registration using phone, laptop, computer.
FR-3	User confirmation	➢ Confirmation via Email. ➢ Confirmation via OTP.
FR-4	User interface	➢ User login form. ➢ Admin login form.
FR-5	Database	➢ It collects at least 50 images of each type of skin disease placed them in folder. ➢ Using a chrome extension such as batch downloader where you can search and download images from chrome.
FR-6	Data server	➢ It connects a data from chrome and the application to the cloud. ➢ Data server has been installed to run as a service and is deployed in IBM cloud instance.

4.2 Non-functional Requirements:

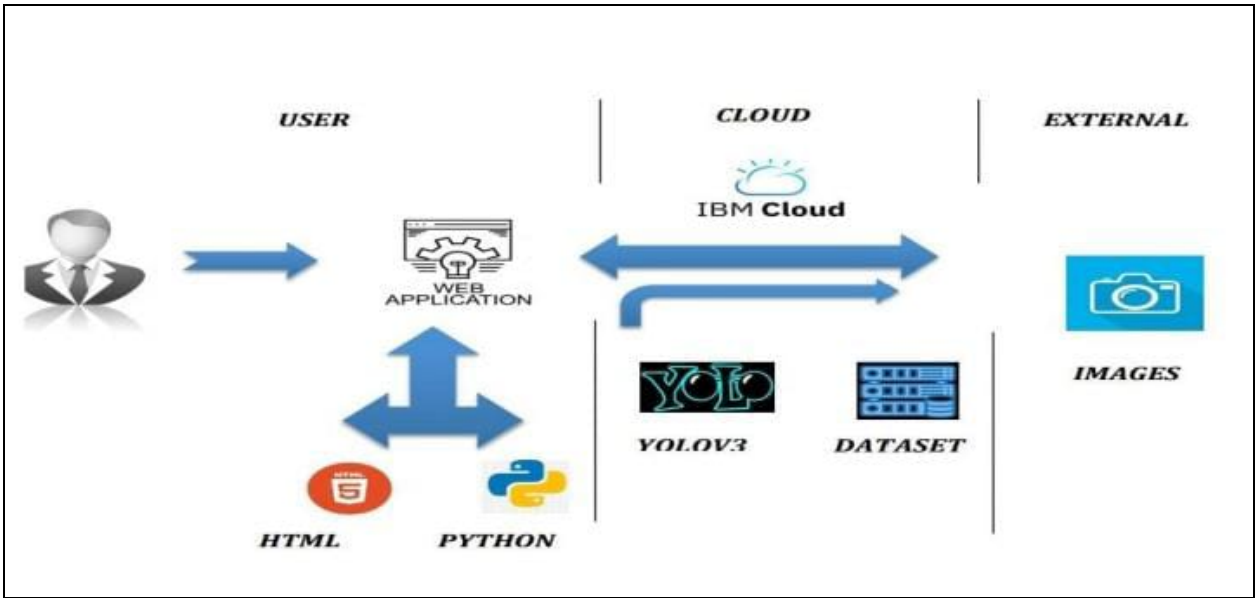
FR NO	Non functional requirement	Description
NFR-1	Usability	➢ YOLO trainer model can help the dermatologist to detect whether the patient have skin disease or not. ➢ Visual object tagging tool (VOTT) can annotate images for understanding.
NFR-2	Security	➢ It ensure about patient safety during process.
		➢ Careful examine about choosing an image for detecting or uploading images of your damaged skin.
NFR-3	Reliability	➢ Easy to use with good network connection. ➢ Accuracy ➢ Less time consumption ➢ Low cost.
NFR-4	Performance	➢ Creating a model with an application can be very helpful to the people who are affected by skin disease. ➢ The trained model can predict an accurate result and took less time when compare to reality.

NFR-5	Availability	➢ Easy to detect even when there is many images of skin which accurate results. ➢ Helps to get correct treatment at a correct time, which helps patients to heal earlier. ➢ Make use the application at anytime with proper guidelines.
NFR-6	Scalability	➢ This method is ensured accurate information about patients skin disease. ➢ patient need not to be worried about their condition.

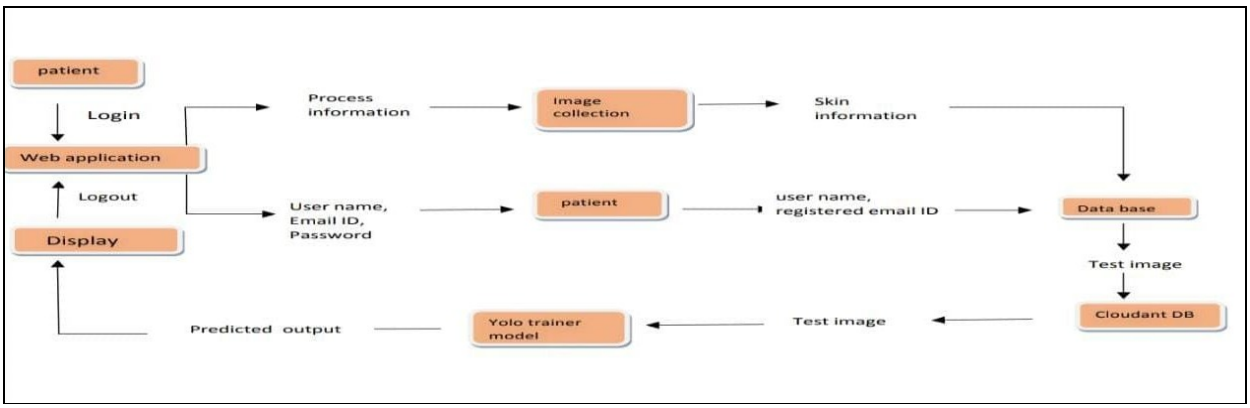
5. PROJECT PHASE II-DATA FLOW DIAGRAMS & USER STORIES

5.1 Data flow diagrams:

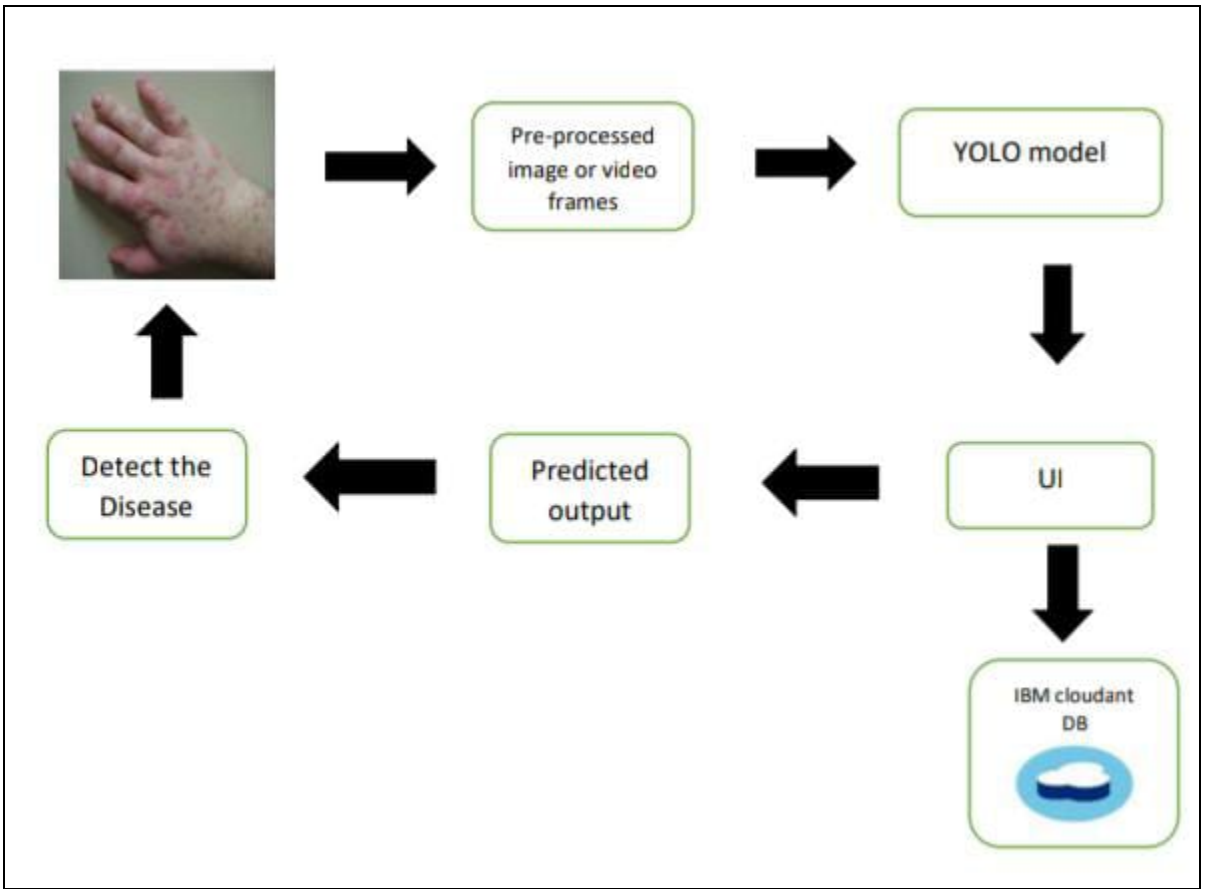
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

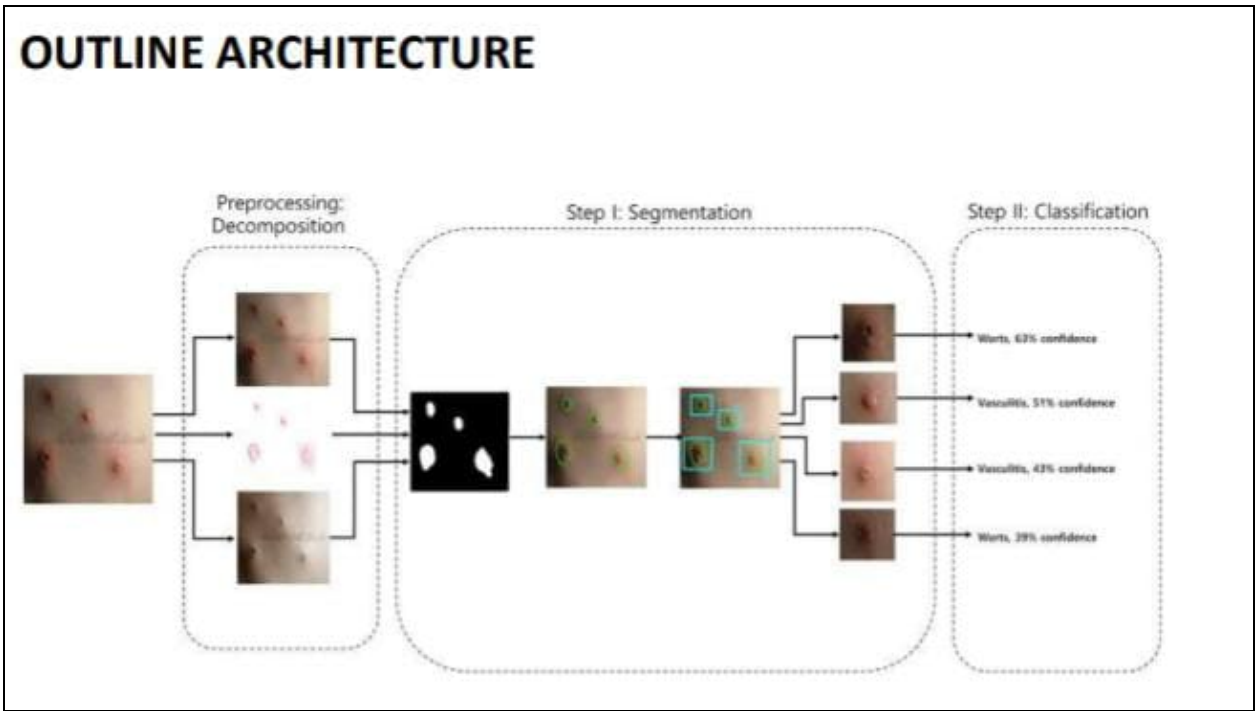


DFD level 0:



5.2 Solution Architecture:





5.2.1 TECHNICAL ARCHITECTURE:

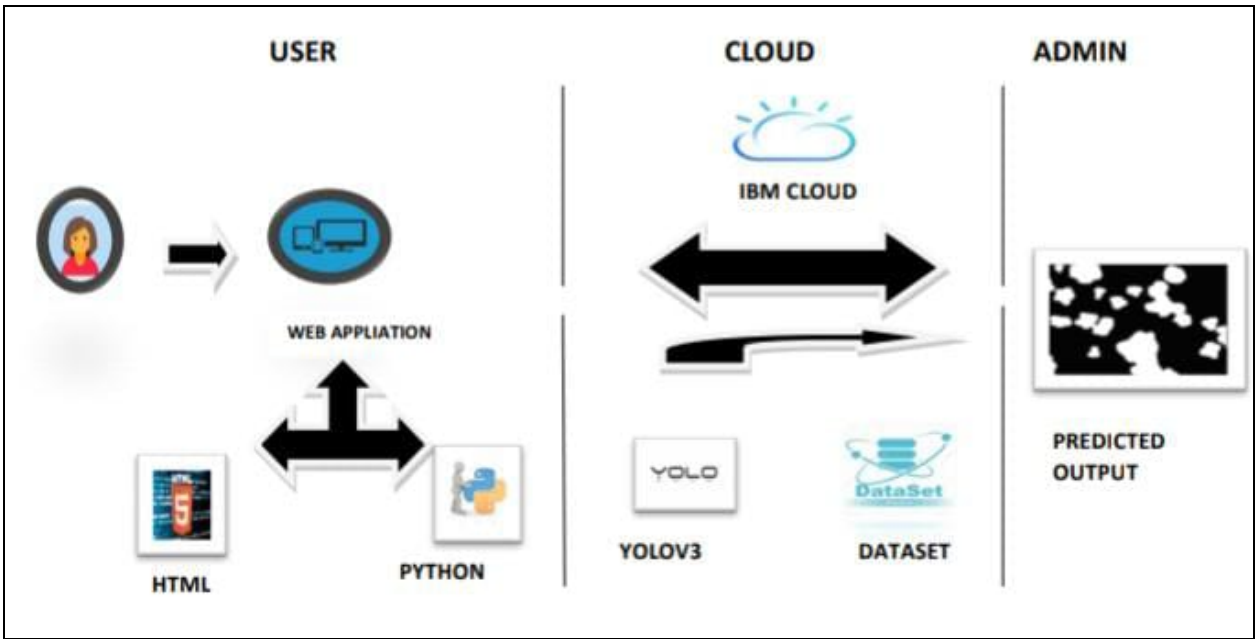


Table 1: Components & Technologies

S.No	Components	Description	Technology
1.	User interface	User interact with web application.	HTML.
2.	Application Logic--1	Build HTML page for login, Registration, Prediction ,Logout.	Python,WSGI application.
3.	Application logic--2	YOLOv3 detector is real time object detection algorithm specify the object in image.	Python
4.	Application Logic--3	Computer vision can gain high understanding of images.	OpenCV, machine learning software.
5.	Database	Using chrome extension such as batch downloader where you can search and download image from chrome.	Fatkun Batch Downloader.
6.	Cloud Database	IBM Cloud Identity & Access Management enables you to securely authenticate users and control access to all cloud resource consistently.	IBM Bluemix cloud platform.
7.	File Storage	File storage requirements.	Local file system or

			other storage service.
8.	ExternalAPI--1	Registration through email.	HTML page.
9.	ExternalAPI--2	Confirmation via email.	E-mail
10.	Infrastructure (Server & Cloud)	Data server has been installed to run as a service and deployed in IBM cloud instance.	IBM Bluemix cloud platform.

Table-2:Application Characteristics

S.No	Characteristics	Description	Technology
1.	Open source frame work	Annotate image,VOTT.	Cloudant DB.
2.	Security implentation	Careful examine about choosing an image for detecting or uploading images of your damaged skin.	Encryption.
3.	Scalable Architecture	This method is ensured accurate information about patient skin disease.	Deep learning.
4.	Availability	Help to get correct treatment at a correct time which help patients	Image processing.

		to get heal in earlier stage	
5.	Performance	The trained model can predict an accurate result and took less time when compare to reality.	IBM Cloud.

5.3 User stories:

The following list out all the user stories for the product.

User type	**Functional requiremnts (Epic)**	**User story number**	**User story/task**	**Acceptance criteria**	**Priority**
Patient (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering name, email ID, password.	I can access my account / dashboard	High
		USN-2	As a user, I will receive a confirmation email once I have registered for the application.	I can receive a confirmation email & click confirm	High

		USN-3	As a user, I can register for the application through link in Google chrome.	I can register & access the dashboard with Google	High
		USN-4	As a user, I can register for the application through Gmail.	I can register through Gmail.	Medium
	Login	USN-5	As a user, I can login to the application by entering registered email ID, Password	I can receive login credential.	High
		USN-6	As a user, I can logout from the application when logout is clicked it redirects to the logout.html	I can also receive logout credential.	High

			page.		
	Interface	USN-7	As a user, the interface should be easy to access.	I can able to access easily.	Medium
Patient (webuser)	Dashboard	USN-8	As a user, I can give the specific Info (skin image, skin color, skin tone, variation in skin, texture, screening test,).	I can able to know about how depth the disease is.	High
Patient (input)	View manner	USN-9	As a user, I can view disease details in visual representation (images)	I can easily understand by using images visually	High
	Color visibility	USN-10	As a user, I can able to see the skin color due to infected area.	I can easily know about the condition of skin color.	High
	Knowledge	USN-11	As a user, I can able to know about the disease	I can easily know whether I have disease or not	High

			details in early stage		
Administrator	Risk tolerant	USN-12	An administrator who Is handling the website should update and take care of the application.	Admin should monitor the records properly.	Medium

6. PROJECT PLANNING & SCHEDULING

6.1 sprint planning & estimation

ProductBacklog, Sprint Schedule, and Estimation

Sprint	Functional Requirement(Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, Ican register for the application by entering my email, password, and confirming my password.	3	High	Aiswarya
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the	2	Medium	Fashiha

			application			
Sprint-2		USN-3	As a user, I can register for the application through mobile number	3	High	Yukthamuki
Sprint-2		USN-4	As a user. I will receive confirmation SMS	3	High	Jumanajashrin
Sprint-2	Login	USN-5	As a user, I can log into the application by entering login credentials	3	High	Aiswarya Fashiha
Sprint-3	Dashboard	USN-6	As a user, I can upload my images and get my details of skin diseases	3	High	Yukthamuki Jumanajashrin
Sprint-1	Logout	USN-7	As a user, I can upload my images and get my details of skin diseases	2	Medium	Fashiha
Sprint-4	Feedback	USN-8	As a customer care executive, I can able to interact with all the customer and get their feedback	2	Medium	Aiswarya

			which is used to enhance the scope of the project			
Sprint-3	Image processing	USN-9	The upload image is preprocessed and fed into the trained yolo model	3	Medium	Fashiha yukthamuki
Sprint-4	Classification and prediction	USN-10	The yolo model classify and predict and the type of disease and the area is affected	3	High	Jumanajashrin Aiswarya yukthamuki
Sprint-4	Report Generation	USN-11	Based on the prediction on the prediction of skin disease,the health care report generated to provide feedbacks	2	High	Jumanajashrin

6.2 sprint delivery schedule

Project Tracker, Velocity& Burndown Chart

Sprint	TotalStory Points	Duration	Sprint StartDate	Sprint EndDate (Planned)	Story Points Completed(as Planned end date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	29 Oct 2022	04 Nov 2022	20	04 Nov 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

Velocity

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points persprint). Let’s calculate the team’s averagevelocity (AV) per iteration unit (story pointsperday)

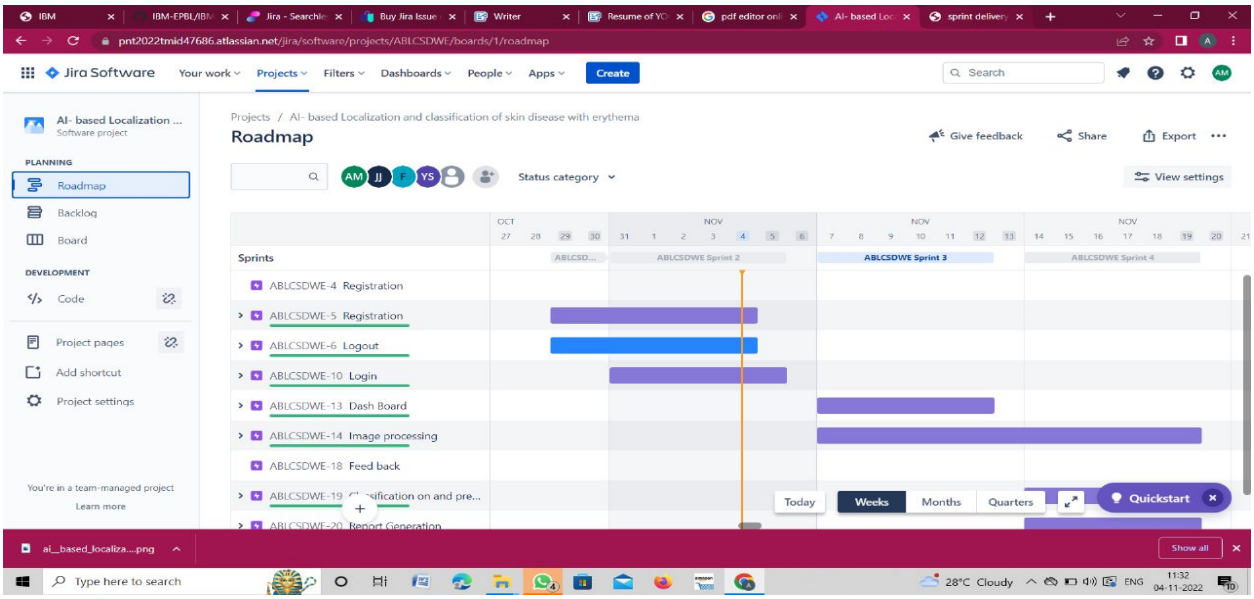
Average Velocity = Story Points per Day Sprint Duration = Number of (Duration) days perSprintVelocity = Points per Sprint

$$AV = \mathbf{20}/\mathbf{6} \approx 4$$

Therefore, the AVERAGE VELOCITY IS 4 POINTS PER SPRINT.

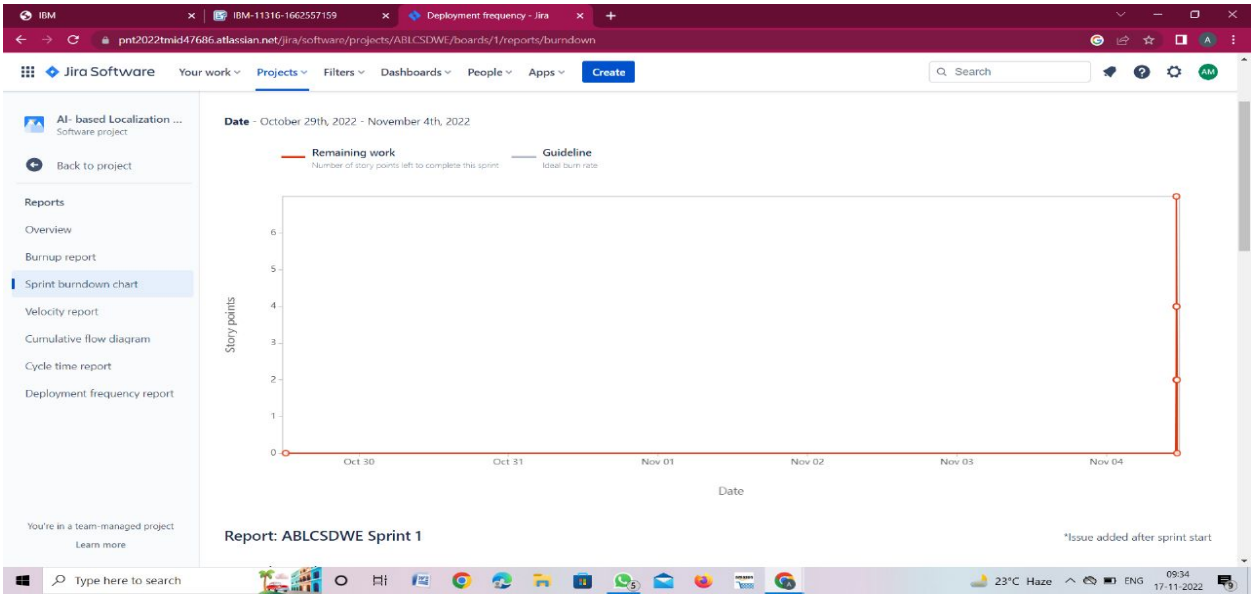
6.3 Report from JIRA

Jira Roadmap

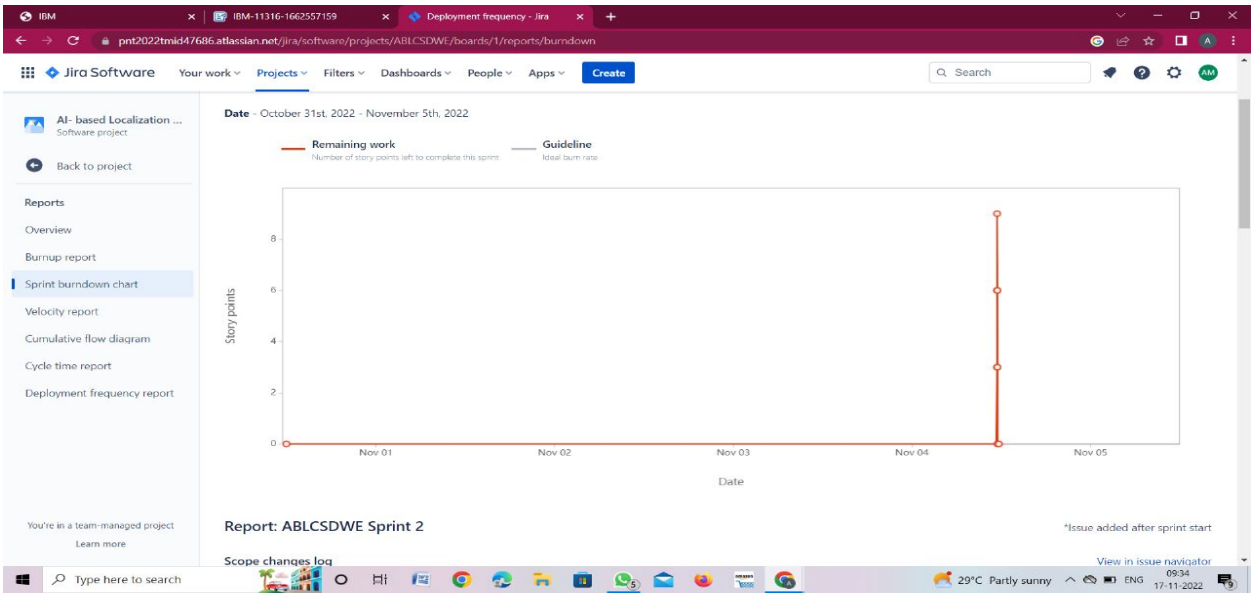


Burndown chart

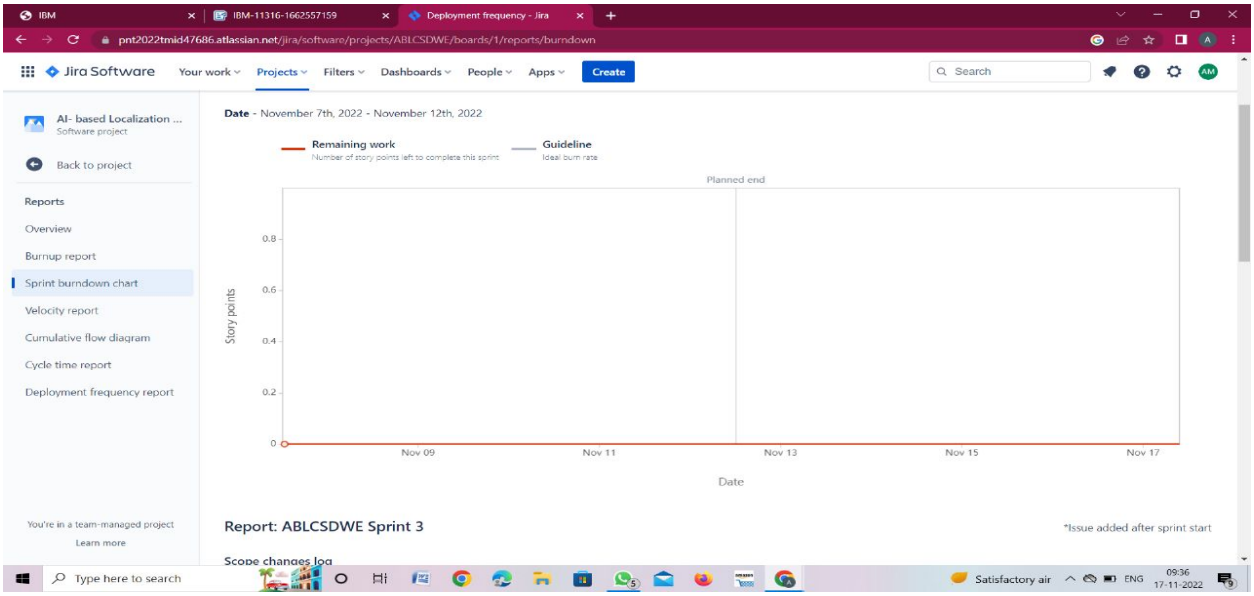
sprint1



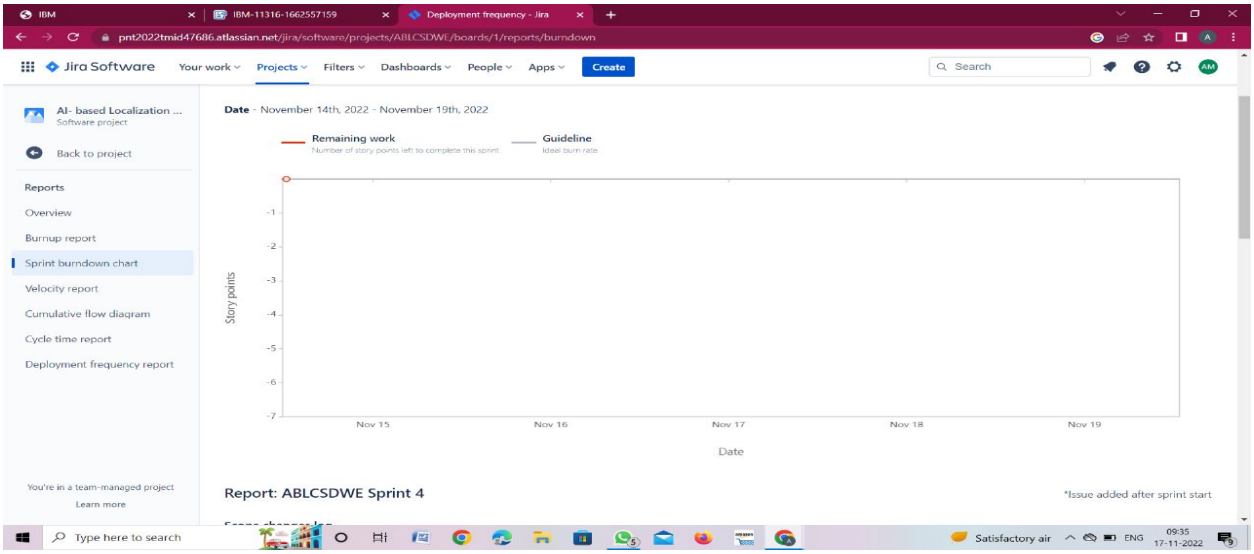
sprint 2



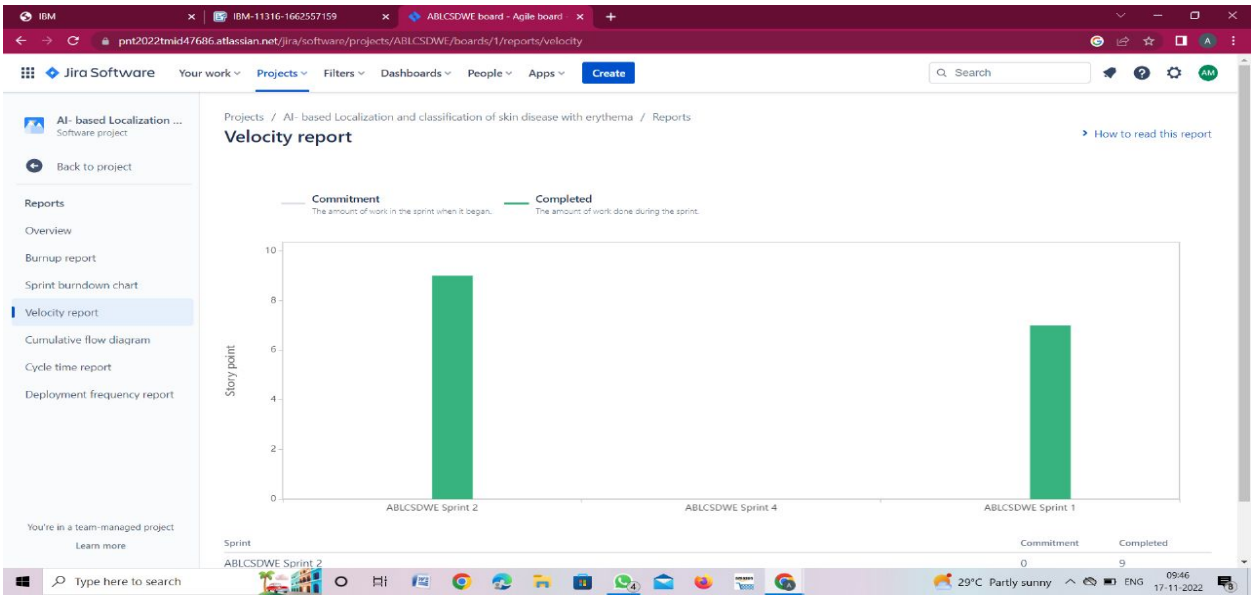
sprint 3



sprint4



veocity report



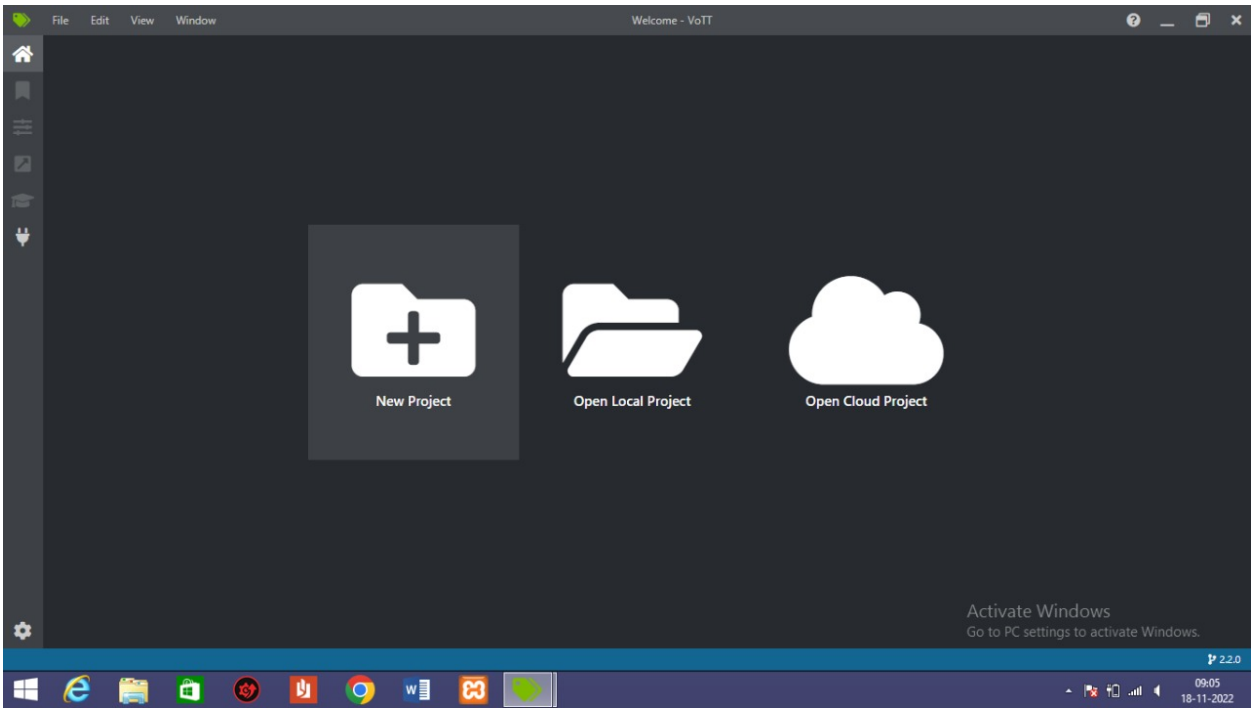
Burn down Chart

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.

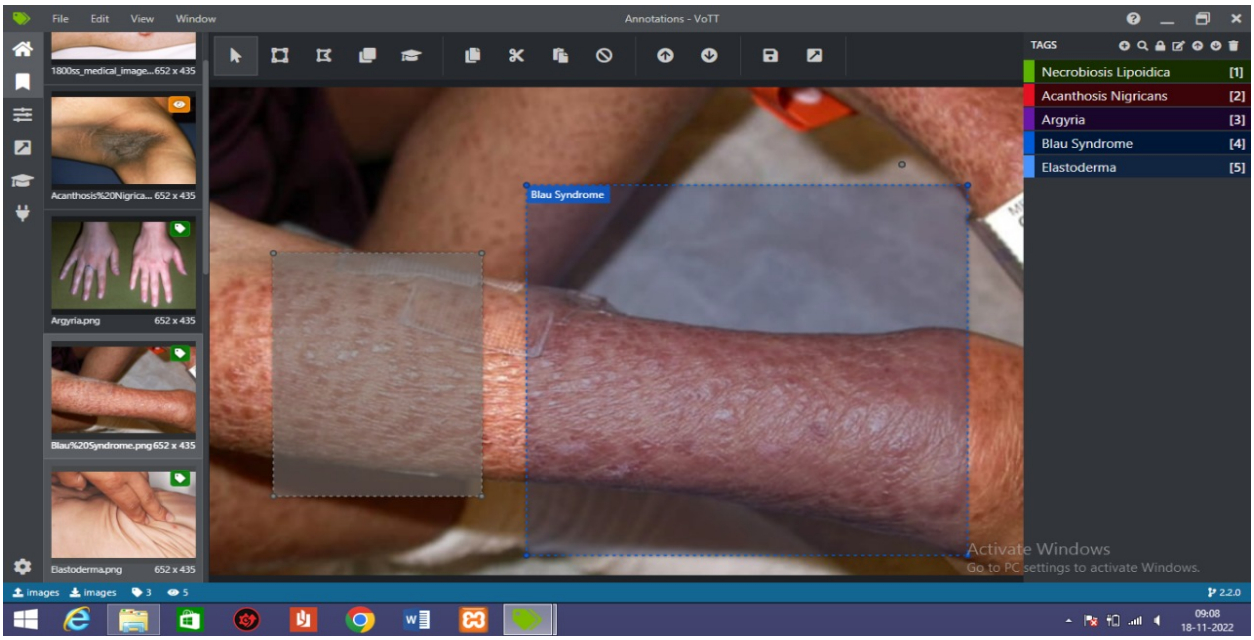
7. CODING AND SOLUTION

7.1 Feautures

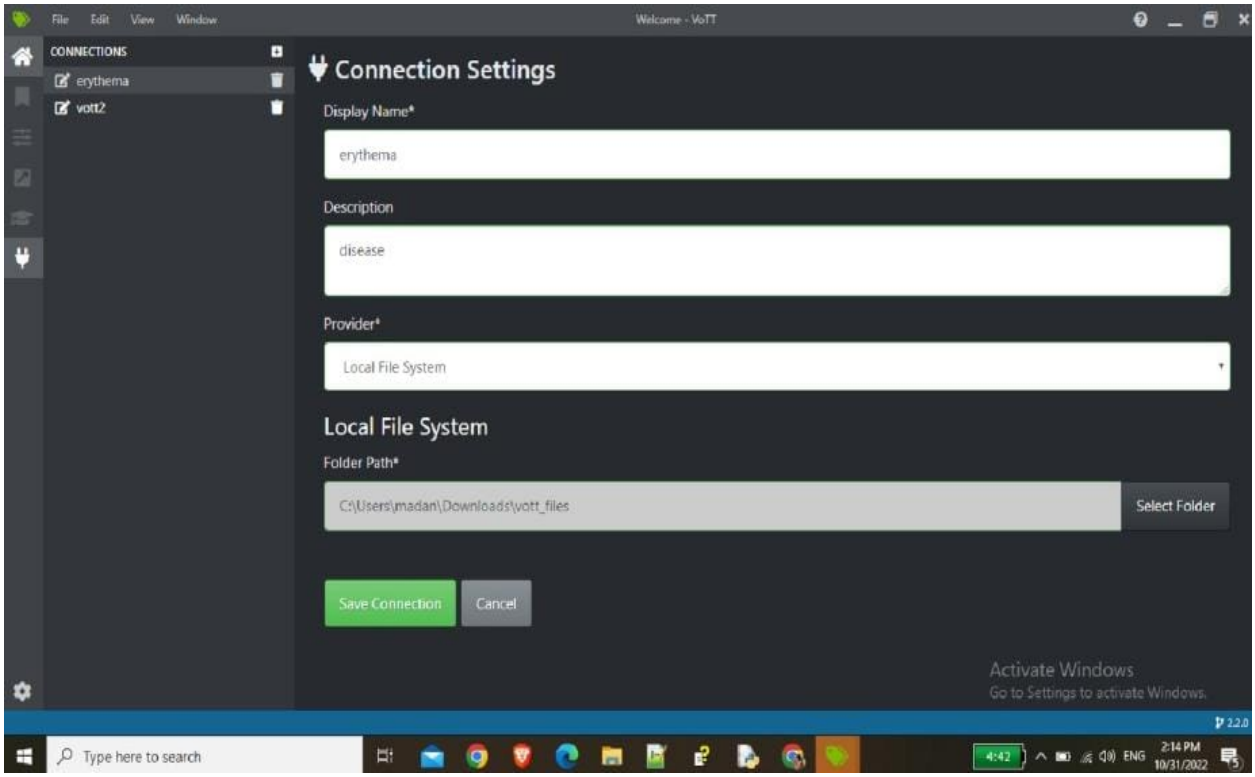
Feauture 1: Microsoft visual objective Tagging(VOTT)



Feauture 2: Predict image



Feauture 3: Display the detected disease



8. TESTING

Test Scenarios

1. Verify python code is run without error.
2. Verify the login the Cloud Service
3. Verify the images are stored in the database.
4. Verify to create a serive credentials.
5. To create a web UI to interact with user.
6. Get an Predicted image in display.

8.1 Test cases

			Date	17-Nov-22							
			Team ID	PNT2022TMID47686							
			Project Name	Project - ai based localization and classification of skin disease with erythema							
			Maximum Marks	4 marks							
Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	TC for Automation(Y/N)	BUG ID	Executed By
Code	python3.11	Verify python code is run without error	Software	1.Download the python version3.11 2.Type the program and save it 3.Verify it is run continuously	Type python code to create backend	Successfully created an web	Working as expected	Pass	YES	NIL	Aiswarya.M
Functional	IBM Cloud Service	Verify login to the cloud service	IBM Cloud Service	1.Login in cloud.ibm.com 2.Create an your own account	Email ID aiswaryam2k@gamil.com password: 7-NGJRCHE-YYIIM	Successfully created an account	Working as expected	pass	YES	NIL	Fashiha.A
Dataset	IBM Cloud Service	Verify the database is created in the IBM Cloud and get the service credentials	IBM Cloud Service	1.In IBM Cloud service go to catalog 2.To create the database go to cloudant 3.Launch dashboard to create database	create a database with click an create button and store the images	Name as my_dataset and store 21 bytes data	working as expected	pass	YES	NIL	Yukthamuki.S
Functional	Python flask	To create a web UI to interact with user	pycharm IDE	1.Go to dashboard 2.open a web link 3.display the result	aiswaryam2k@gamil.com password: skinanalysis1234	website should show the accurate result of detected disease.	Working as expected	pass	YES	NIL	Jumana jashrin.S
Functional	Login page	Verify user is able to log into website with Valid credentials	Login first	1.Go to login page 2.Enter email ID and password 3.click to register	aiswaryam2k@gamil.com password: skinanalysis1234	successfully log in to the website	Working as expected	Pass	YES	NIL	Aiswarya.M Fashiha.A
Functional	website	Verify user is able to upload the image	choose an image from drive to upload	1.Go to the prediction page 2.click to choose button and uploade the image	name of the detected skin image	prediction should show accurate result of the disease name	Working as expected	Pass	YES	NIL	Yukthamuki.S Jumana jashrin.S
Functional	Logout page	Verify user is able to log into website	Logout	click logout on the top right corner to get successfully logout from the website	successfully logout from the websit	successfully logout from the websit	Working as expected	pass	YES	NIL	Aiswarya.M

8.2 USER ACCEPTANCE TESTING

1.Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of [product name]project time of the release to User Acceptance Testing(UAT).

2.Defect Analysis

This report shows the number of resolved or closed bugs at each severity level,and how they are resolved.

Resolution	Severity1	Severity2	Severity3	Severity4	Sub Total
By design	5	3	2	0	10
Duplicate	0	0	0	1	1
External	2	0	0	1	3
Fixed	6	2	0	0	8
Not Reproduced	0	1	1	0	2
Skipped	0	0	0	0	0
Won't Fix	0	0	0	0	0
Totals	13	6	3	2	24

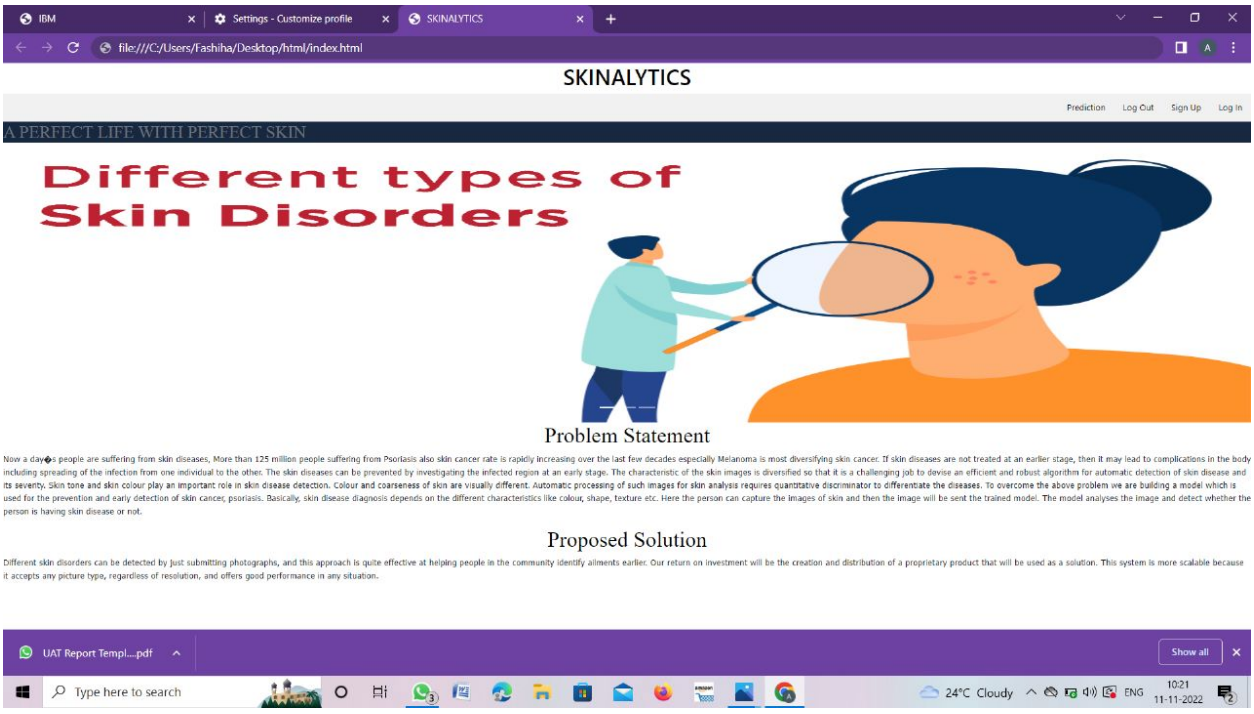
3.Test case Analysis

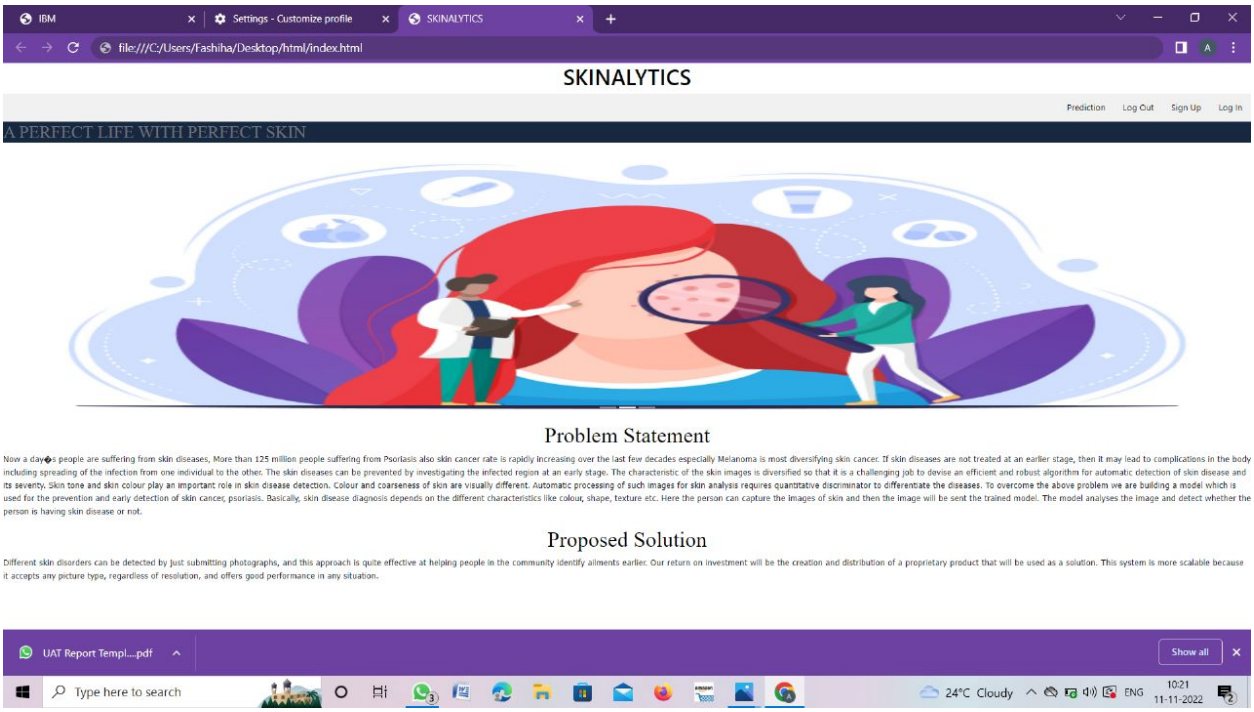
This report shows the number of test cases that have passed ,failed,and untested.

Section	Total cases	Not tested	Fail	Pass
Interface	1	0	0	1
Login	2	0	0	2
Logout	1	0	0	1
Limit	2	0	0	2

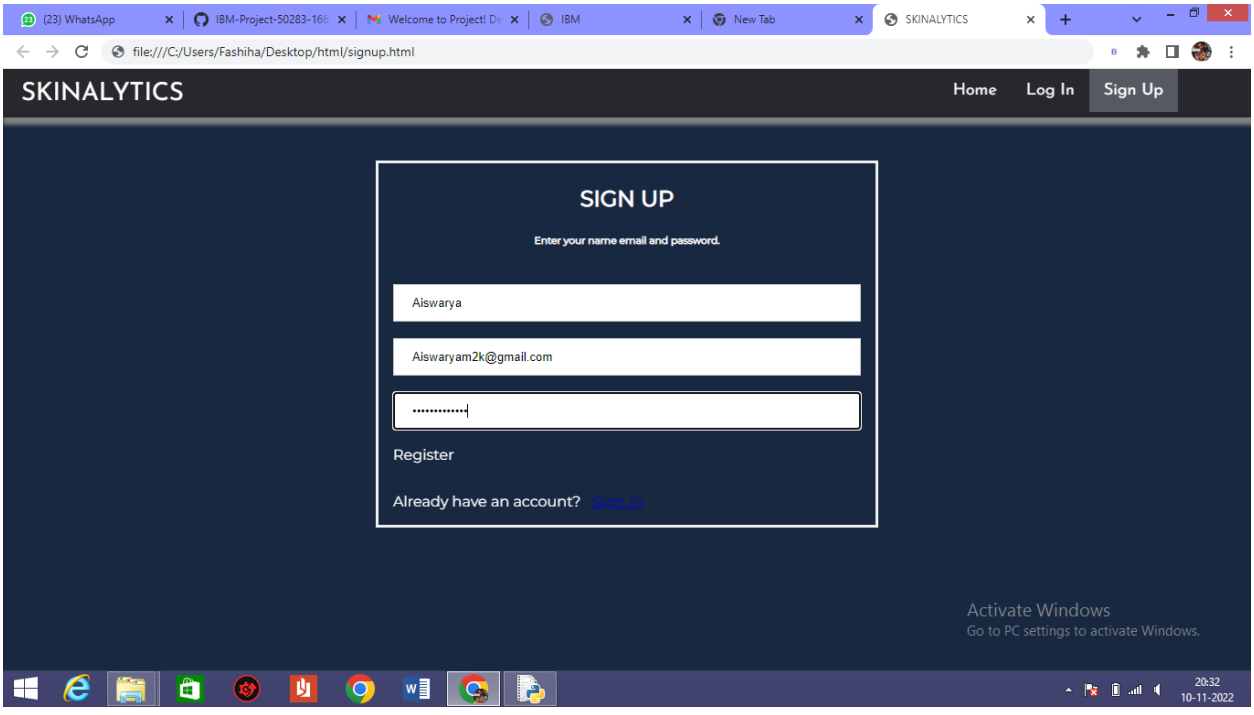
9. RESULTS

Home page

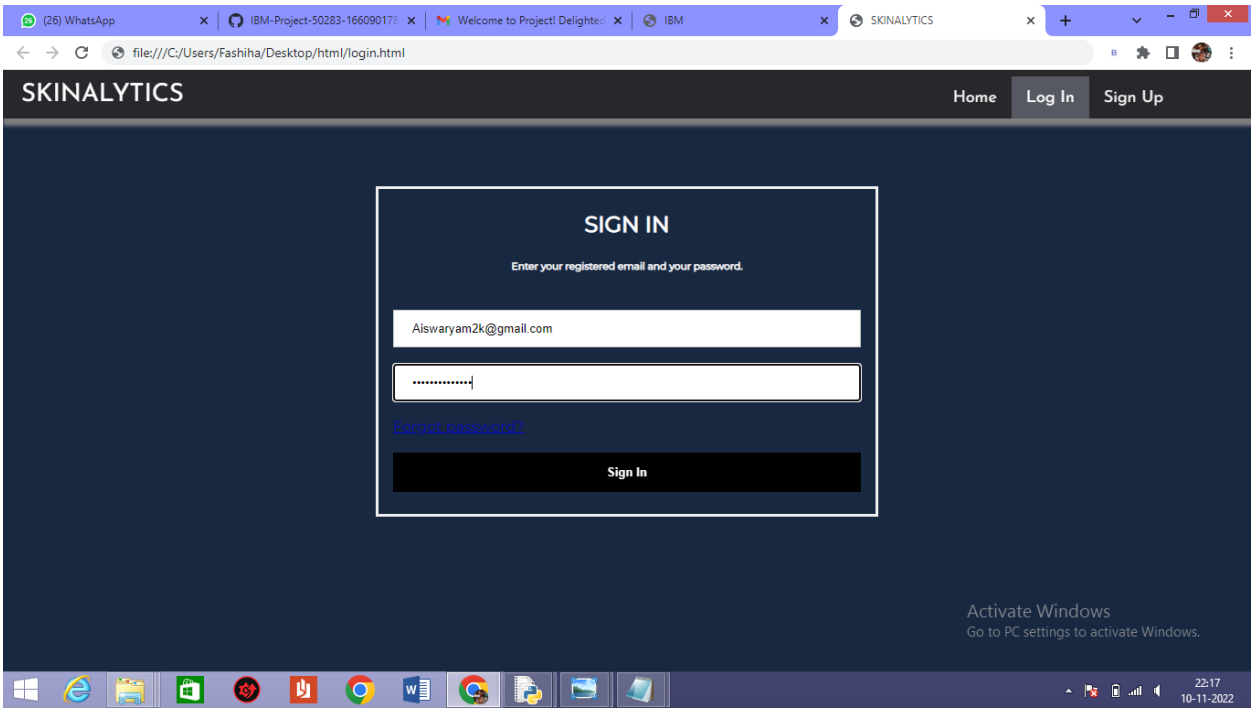



IBM
Settings - Customize profile
SKINALYTICS
file:///C:/Users/Fashiha/Desktop/html/index.html
SKINALYTICS
Prediction
Log Out
Sign Up
Log In
A PERFECT LIFE WITH PERFECT SKIN
Problem Statement
Now a day s people are suffering from skin diseases, More than 125 million people suffering from Psoriasis also skin cancer rate is rapidly increasing over the last few decades especially Melanoma is most diversifying skin cancer. If skin diseases are not treated at an earlier stage, then it may lead to complications in the body including spreading of the infection from one individual to the other. The skin diseases can be prevented by investigating the infected region at an early stage. The characteristic of the skin images is diversified so that it is a challenging job to devise an efficient and robust algorithm for automatic detection of skin disease and its severity. Skin tone and skin colour play an important role in skin disease detection. Colour and coarseness of skin are visually different. Automatic processing of such images for skin analysis requires quantitative discriminator to differentiate the diseases. To overcome the above problem we are building a model which is used for the prevention and early detection of skin cancer, psoriasis. Basically, skin disease diagnosis depends on the different characteristics like colour, shape, texture etc. Here the person can capture the images of skin and then the image will be sent the trained model. The model analyses the image and detect whether the person is having skin disease or not.
Proposed Solution
Different skin disorders can be detected by just submitting photographs, and this approach is quite effective at helping people in the community identify ailments earlier. Our return on investment will be the creation and distribution of a proprietary product that will be used as a solution. This system is more scalable because it accepts any picture type, regardless of resolution, and offers good performance in any situation.
UAT Report Templ....pdf
Show all
Type here to search
24°C Cloudy
ENG
10:21
11-11-2022

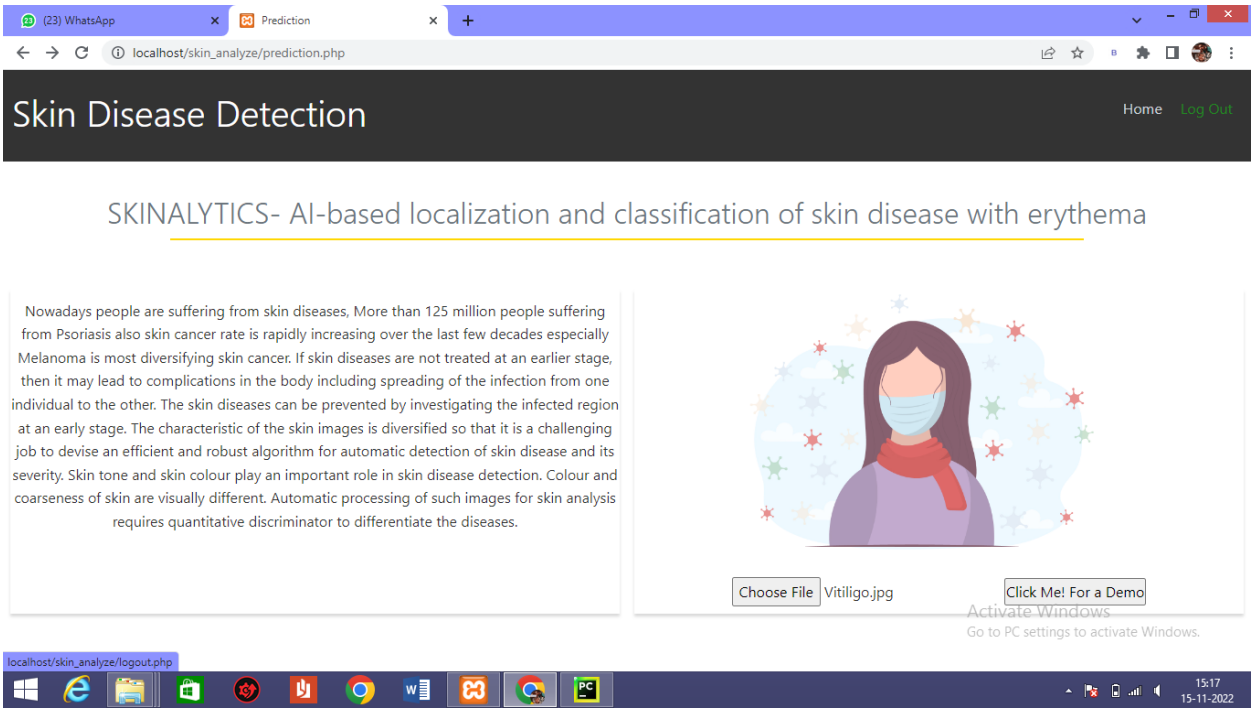
Signup page


(23) WhatsApp
IBM-Project-50283-166
Welcome to Project! De
IBM
New Tab
SKINALYTICS
file:///C:/Users/Fashiha/Desktop/html/signup.html
SKINALYTICS
Home
Log In
Sign Up
SIGN UP
Enter your name email and password.
Aiswarya
Aiswaryam2k@gmail.com
Register
Already have an account? Sign In
Activate Windows
Go to PC settings to activate Windows.
20:32
10-11-2022

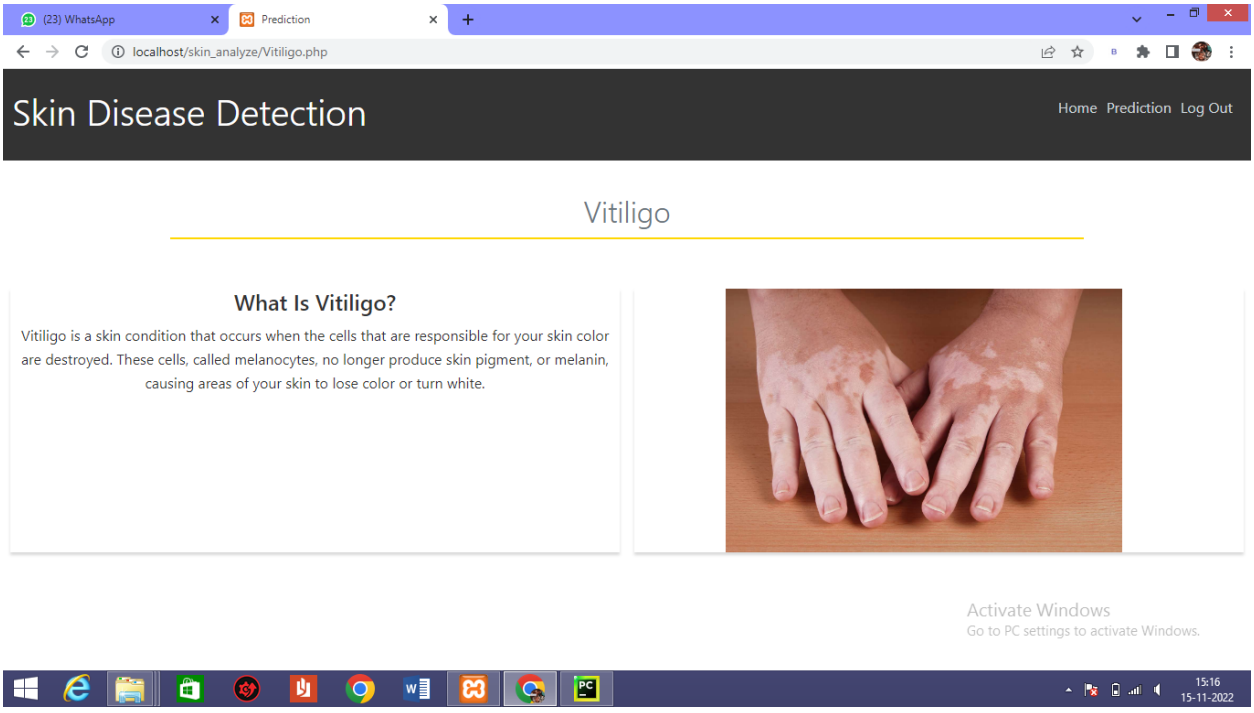
Login page



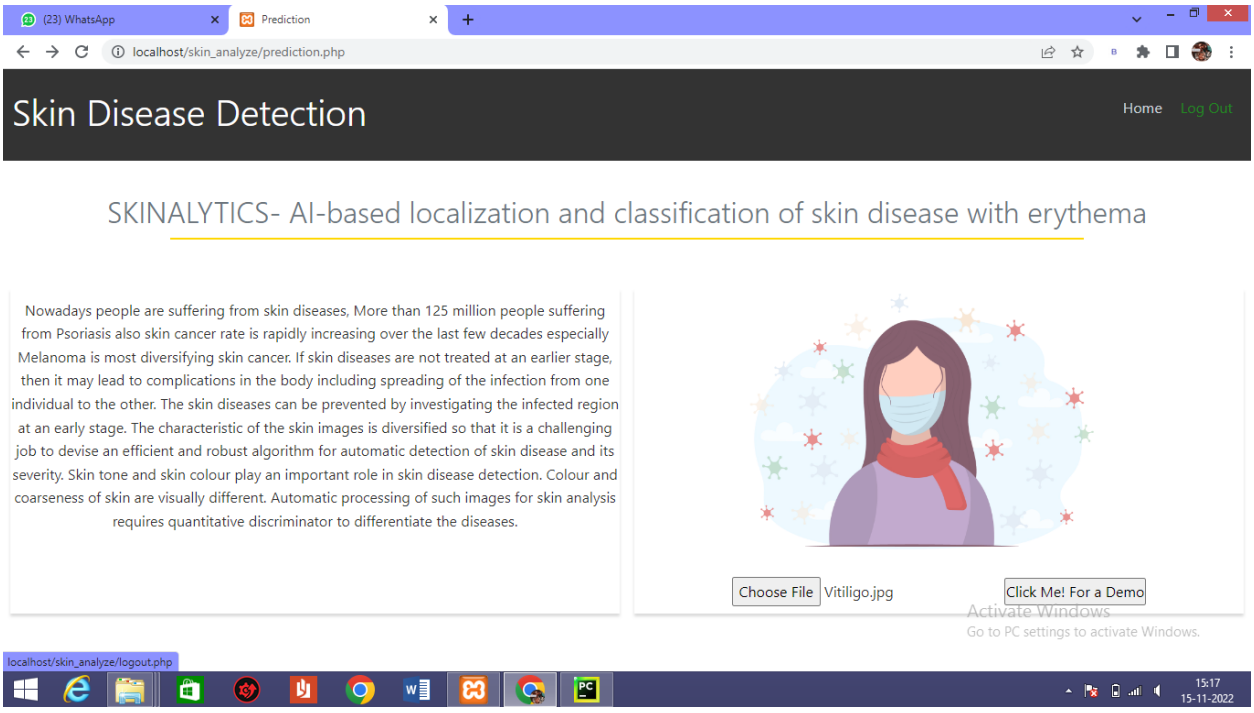
prediction page



Result page



logout page



10.ADVANTAGES

- ➤ The technology can be used for accurate disease classification and early diagnosis.
- ➤ Artificial intelligence can assist providers in a variety of patient care and intelligent health systems.
- ➤ AI has the ability to analyze big data sets – pulling together patient insights and leading topredictive analysis.

DISADVANTAGES

- This may result in avoidable diagnostic inaccuracies as a result of human error.

- Classification of disease is difficult due to the strong similarities between common skin disease symptoms.

- AI may bring considerable threats of privacy problems,ethical concerns and medical errors

11. CONCLUSION

we are building a model which is used for the prevention and early detection of skin cancer, psoriasis. Basically, skin disease diagnosis depends on the different characteristics like colour, shape, texture etc. Here the person can capture the images of skin and then the image will be sent the trained model. The model analyses the image and detect whether the person is having skin disease or not.It help you to detect all type of diseases like infection,allergies,rashes etc..

12. FUTURE SCOPE

- Using imaging methods,it could be possible for deep learning to assist or even replace dermatologists in the diagnosis of skin

disease in the near future.

- ➤ It transforms the data into representations that are important for discriminating the data.

- ➤ Deep learning algorithms have undergone considerable development because of improved capabilities of hardware such as GPU.

- ➤ It has dramatically improved tasks in different scientific and industrial fields.

PREDICTION

With the help of AI,your mobile app can predict your disease,according to your patient's problem.Moreover,it can recommand apps and websites insights on detect the diseases.

13. APPENDIX

Source code:https://github.com/IBM-EPBL/IBM-Project-11316-1659288362/blob/main/Final%20Deliverables/Source%20Code

GitHub Link:https://github.com/IBM-Project-11316-1659288362

Project Demo Link:https://drive.google.com/file/d/1LPLpeo4Q1BUN6xuntH7X0YYT

eRf_KW81/view?usp=share_link