Project Report

AI-based localisation and classification of skin diseases with erthyma

Submitted by

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CHAPTER 1

INTRODUCTION

1.1 PROJECT OVERVIEW

Skin disease among humans has been a common disease, millions of people are suffering from various kinds of Skin diseases. Usually, these diseases have hidden dangers which lead to not only lack of selfconfidence and psychological depression but also lead to a risk of skin cancer. Medical experts and highlevel instruments are needed to diagnosis these skin diseases due to non-availability of visual resolution in skin disease images. The proposed framework includes deep learning techniques such as CNN architecture and three predefined models called Alex Net, ResNet, InceptionV3. A dataset of images with seven diseases has been taken for the classification of skin diseases. They include diseases like Melanoma, Nevus, Seborrheic Keratosis etc. The dataset was extended by adding images having cuts and burns, which were classified as skin disease by most of The existing systems. The usage of deep learning algorithms has reduced the need for human labor, such as manual feature extraction and data reconstruction for classification purposes.

1.2 PURPOSE

The main purpose of our project is to localisation and classification of skin diseases with erthyma by using Artificial Intelligence. AI has the potential to assist in the diagnosis of skin lesions and may have particular value at the interface between primary and secondary care. It offers a personalized experience to patients in terms of managing their queries.

CHAPTER 2

LITERATURE SURVEY

2.1 EXISTING PROBLEMS

Skin diseases are ranked fourth most common cause of human Illness, but many still do not consult doctors. We presented a robust and automated method for the diagnosis of dermatological diseases. Treatments for skin are more effective and less disfiguring when found early. We should point out that it is to replace doctors because no machine can yet replace the human input on analysis and Intuition. Researches in European Society of Medical Oncology Have shown for the first time that form of AI or ML is better than experienced dermatologists. In this a brief description of the system and the implementation methodology is presented.

2.2 REFERENCES

1) Erythema detection in digital skin images

AUTHORS : Lu, J., Manton, J. H., Kazmierczak E. & Sinclair, R. In 2010 IEEE International Conference on Image Processing, Hong Kong, 2545–2548.

We have shown that even without a large dataset and high-quality images, it is possible to achieve sufcient accuracy rates. In addition, we have shown that current state-of-the-art CNN models can outperform models created by previous research, through proper data preprocessing, self-supervised learning, transfer learning, And special CNN architecture techniques. Furthermore, with accurate segmentation, we gain knowledge of the location of the disease, which is useful in the preprocessing of data used in classifcation, as it allows the CNN Model to focus on the area of interest. Lastly, unlike previous studies, our method provides a solution to

classify mulltiple diseases within a single image. With higher quality and a larger quantity of data, it will be viable to use State-of-the-art models to enable the use of CAD in the feld .

2)Segmentation and classification of skin disease diagnosis

AUTHORS : Sumithra, R., Suhil, M. & Guru, D. S. Proced. Comput. Sci.45, 76–85.

The project achieved 94.4% accuracy in determining the Seven skin diseases. Using undersampling method and the default preprocessing of input data achieved an 84.28% accuracy on the test dataset. While, using the imbalanced dataset and the default preprocessing of input data achieved a 93.6% accuracy. Then, the researcher used oversampling and the model attained a 91.8% accuracy. Lastly, using the oversampling and data augmentation technique provide an accuracy of 94.4%. In conclusion, in order to enhance the accuracy of the model different sampling techniques and preprocessing of input data can be explore. In our study, using oversampling and data augmentation generate the most accurate result.

3) Skin disease recognition method based on image color and texture features

Skin disease among humans has been a common disease, millions of people are suffering from various kinds of Skin diseases. Usually, these diseases have hidden dangers which lead to not only lack of selfconfidence and psychological depression but also lead to a risk of skin cancer. Medical experts and highlevel instruments are needed to diagnosis these skin diseases due to non-availability of visual resolution in skin disease images. The proposed framework includes deep learning techniques such as CNN architecture and three predefined models called Alex Net, ResNet, InceptionV3. A dataset of images with seven diseases has been taken for

the classification of skin diseases. They include diseases like Melanoma, Nevus, Seborrheic Keratosis etc. The dataset was extended by adding images having cuts and burns, which were classified as skin disease by most of The existing systems. The usage of deep learning algorithms has reduced the need for human labor, such as manual feature extraction and data reconstruction for classification purposes.

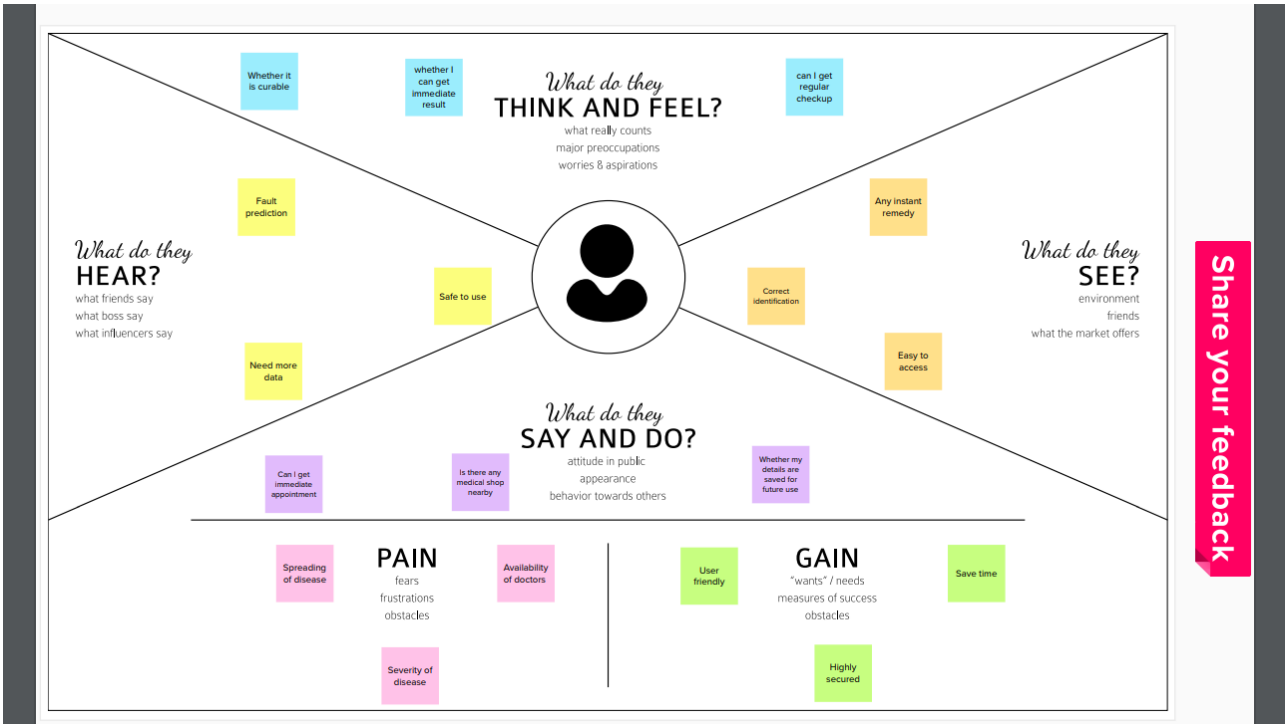
2.3 PROBLEM STATEMENT DEFINITION

Patients with Skin Diseases they may not get proper solution for their skin disease they have used some apps that does not predict correctly .They ask suggestions from friends and relatives. They try to treat themselves by watching videos related to their skin conditions. They used some apps for checking. They have to identify the apperance of the of the disease and give proper answer to the questions. They find this while searching their conditions by themselves on the internet. So they get updated solutions through this project.

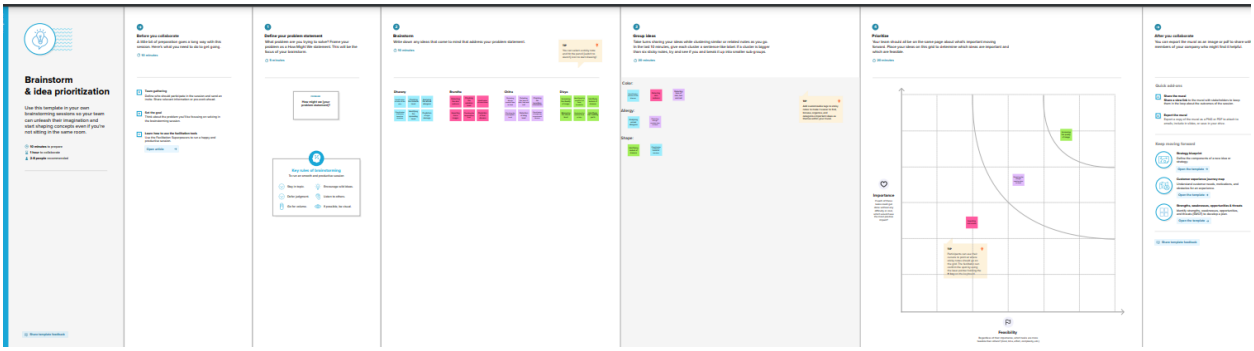
CHAPTER 3

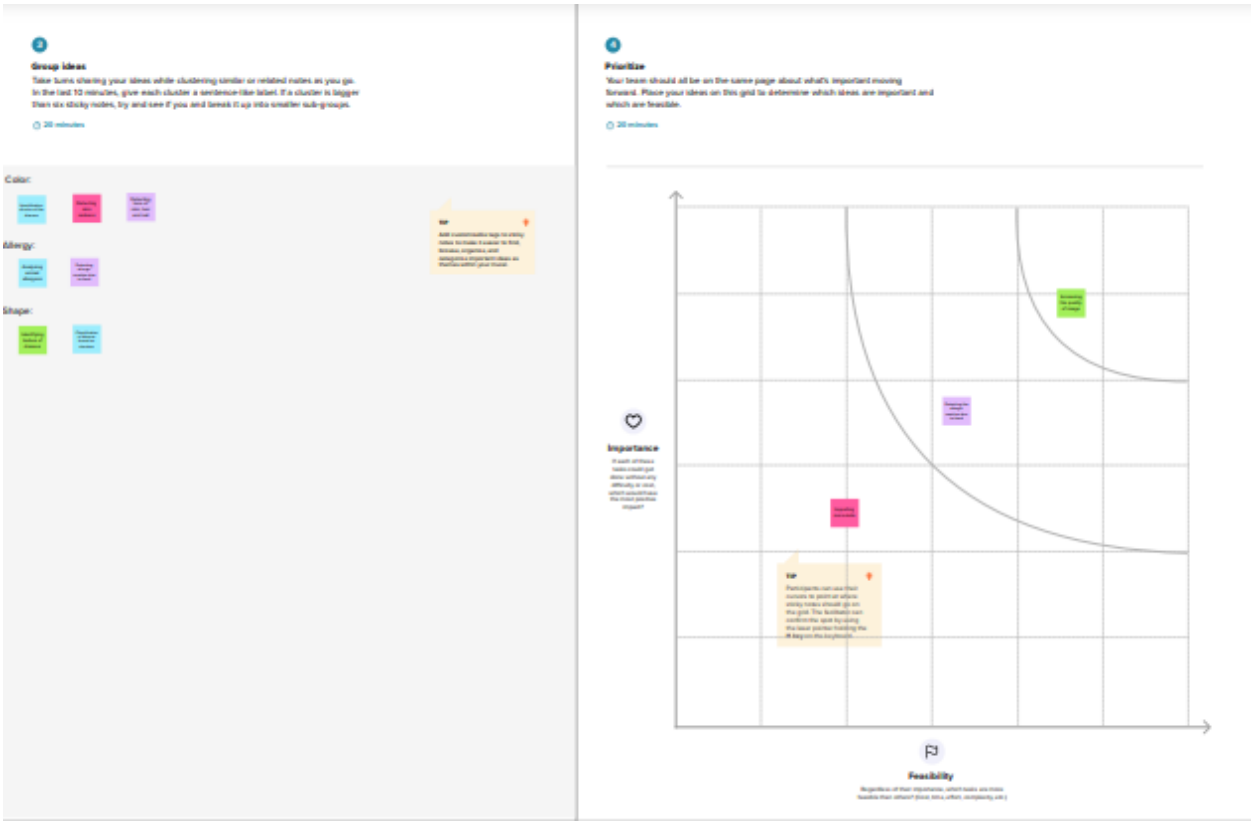
IDEATION AND PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS



3.2 IDEATION & BRAINSTORMING





3.3 PROPOSED SOLUTION

S.No.	Parameter	Description
1	Problem Statement (Problem to be solved)	· Erythema is the skin disease associated with redness or skin rash. · It is caused due to some allergic reaction or infection. Sometimes they are chronic, infectious and may develop into skin cancer. · The diagnosis and treatment of skin diseases like erythema takes longer time and causes financial and physical cost to the patient and also it leads to wrong prediction.
2	Idea / Solution description	· An image processing-based approach is used to diagnose the erythema. In this method, the digital image of disease affects the skin area then uses image analysis to identify the type of erythema. · The approach works on the inputs of a colour image. Then resize the image to extract features using pre pre-trained convolutional neural network. After that it classifies feature using Multiclass SVM. Finally, the results are shown to the user, including the type of disease, spread, and severity.
3	Novelty / Uniqueness	· It has high level of accuracy · It stores the data for future use · It is fast and more stable
4	Social Impact / Customer Satisfaction	· It is easy to access as everyone is using mobile phones now-a-days. · It is ad free as it does not cause interruption while checking their details. · It is highly secured and the data is not delivered to third persons.
5	Business Model (Revenue Model)	· It will be very useful for the customers to use this app. · Based on the report, a dermatologist is assigned who will cater specific needs and build a unique regime. · It recommends skin care products which will be delivered to doorsteps.

3.4 PROBLEM SOLUTION FIT

Project Title: AI- based localization and classification of skin disease with erythema

Project Design Phase-I - Solution Fit Template

Team ID: PNT2022TMID33185

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

Patients with skin disease

6. CUSTOMER CONSTRAINTS CC

They have to pay money for installation.
They may not get proper solution for their skin disease.
They have used some apps that does not predict correctly.

5. AVAILABLE SOLUTIONS AS

They ask suggestions from friends, relatives.
They try to treat themselves by watching videos related to their skin conditions.
They used some apps for checking.

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS J&P

They have to identify the appearance of the disease and give proper answers to the questions.

9. PROBLEM RC

They do not know the type and stage of skin disease. Some of the skin disease shows symptoms several months later, causing the disease to develop and grow further.
This is due to the lack of medical knowledge among them.

7. BEHAVIOUR BE

They use some apps to check their conditions.
They examine their skin texture with the normal persons and ask their suggestions to their conditions such as consulting a dermatologist or to take a home remedy.

Focus on J&P, tap into BE, understand RC

3. TRIGGERS TR

They find this while searching their conditions by themselves on the internet.

10. YOUR SOLUTION SL

An image processing-based approach is used to diagnose the erythema. In this method digital image of disease affects skin area then use image analysis to identify the type of erythema.
The approach works on the inputs of a color image. Then resize the image to extract features using pre-trained convolutional neural networks. After that it classifies features using Multiclass SVM. Finally, the results are shown to the user, including the type of disease, spread, and severity. This can be implemented as a mobile application.

8.CHANNELS of BEHAVIOR CH

8.1 ONLINE
They install some apps and find solution for their skin conditions

8.2 OFFLINE
They will consult a dermatologist

4. EMOTIONS: BEFORE / AFTER EM

They felt panic because of their skin condition
They get confused while trying to find a solution for their conditions by themselves.

CHAPTER 4

REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENTS

FUNCTIONAL REQUIREMENTS

-following are the functional requirements of the proposed solution

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Create Dataset	Splitting the dataset into training set and testing set so that.It can be used for detecting the disease.
FR-2	Annotate Image	It is the task of labelling digital images, involving user's input. It will identify the changes in the user images.
FR-3	Training YOLO	Installing YOLO. It will help to collect the user images and annotate that user images. It will dividing the images into number of grids. Each number of grids is responsible for the detection and localization of the object it contain.
FR-4	Cloudant DB	Then the Convolution Neural Network(CNN) model is deployed on the IBM. By using the convolution neural network the images taken by the training yolo will be detect the skin. Need to import the cloudant library.

4.2 NON FUNCTIONAL REQUIREMENTS

NON-FUNCTIONAL REQUIREMENTS

- Following are the non-functional requirements of the proposed solution

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	It is easy to use.This application will be used by the user at any time.
NFR-2	**Security**	Security is one of the part which protected against attacks or unauthorised access.Stored data is encrypted.
NFR-3	**Reliability**	It will give correct message to the user without any failure.
NFR-4	**Performance**	It cannot be buffered .So user don't get stressed because of that. When the disease is detected the alerting message will be sent to the user. So they will get aware of it.
NFR-5	**Availability**	These requirements are mostly easy to use. Storage based backup is available. It is available for user at any time so user can make use of it.
NFR-6	**Scalability**	It is simple and fast. It does not require expensive equipment's other than mobile phone. It can be

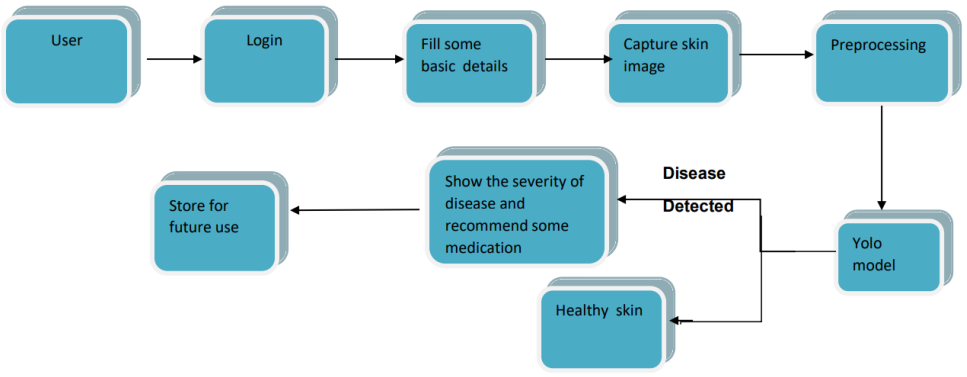
CHAPTER 5

PROJECT DESIGN

5.1 Data flow Diagram

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.

Industry Standard



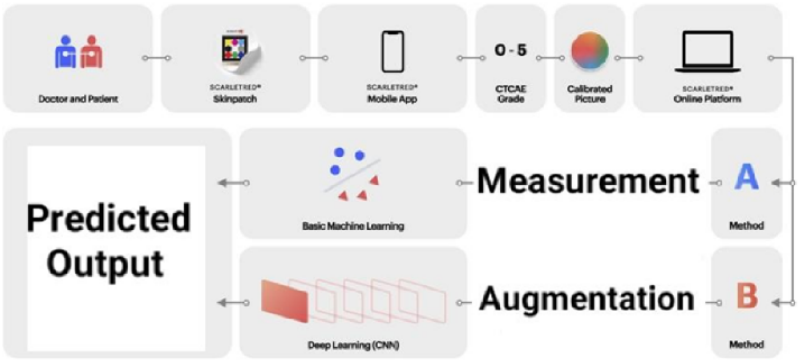
5.2 TECHNOLOGY STACK

Technical Architecture:

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2

Example: Order processing during pandemics for offline mode

Reference: https://developer.ibm.com/patterns/ai-powered-backend-system-for-order-processing-during-pandemics/



Guidelines:

- Include all the processes (As an application logic / Technology Block)
- Provide infrastructural demarcation (Local / Cloud)
- Indicate external interfaces (third party API's etc.)
- Indicate Data Storage components / services
- Indicate interface to machine learning models (if applicable)

5.3 USER STORIES

User Type	Functional Requirement (Epic	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2

		USN-4	As a user, I can register for the application through Gmail	I can register & access the dashboard with Gmail	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can login using my email and password	High	Sprint-1
	Dashboard	USN-6	As a user I can upload skin images as input	I can use my camera or my files to upload images	Medium	Sprint-1
Customer (Web user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1

		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail	I can register & access the dashboard with Gmail	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can login using my email and password	High	Sprint-1
	Dashboard	USN-6	As a user I can upload skin images as input	I can use my camera or my files to upload images	Medium	Sprint-1
Customer care executive	Mail	USN-1	As a customer care executive, I can access customer's information and to solve their queries	I can solve their issues	Medium	Sprint-2
Administrator	Dashboard	USN-1	As a admin I can track the skin condition of user	I can track user activities	High	Sprint-1

		USN-2	As a admin I can recommend medication for user	I can provide medical tips	High	Sprint-2

CHAPTER 6

PROJECT PLANNING AND SECHEDULING

6.1 MILESTONE AND ACTIVITY

Title	Description	Date
Literature Survey & Information Gathering	Literature survey on the selected project & gathering information by referring the, technical papers, research publications etc.	04 OCTOBER 2022
Prepare Empathy Map	Prepare Empathy Map Canvas to capture the user Pains & Gains, Prepare list of problem statements.	17 SEPTEMBER 2022
Brainstorming ideas	List the ideas by organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility & importance.	19 SEPTEMBER 2022
Proposed Solution	Prepare the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc.	03 OCTOBER 2022
Problem Solution Fit	Prepare problem - solution Fit document.	04 0CTOBER 2022
Solution Architecture	Prepare solution Architecture document.	07 OCTOBER 2022
Customer Journey Map	Prepare the customer journey maps to understand the user interactions & experiences with the application	15 OCTOBER 2022
Data Flow Diagrams	Draw the data flow Diagrams and submit for review.	31 OCTOBER 2022
Technology Architecture	Architecture diagram.	31 OCTOBER 2022

Sprint Delivery Plan	Prepare the Sprint delivery on Number of Sprint planning meetings organized, Minutes of meeting recorded.	03 NOVEMBER 2022
Milestone & Activity List	Prepare the milestones & Activity list of the project.	03 NOVEMBER 2022
Project Development Delivery of Sprint- 1,2,3&4	Develop & submit the developed code by testing it.	18 NOVEMBER 2022

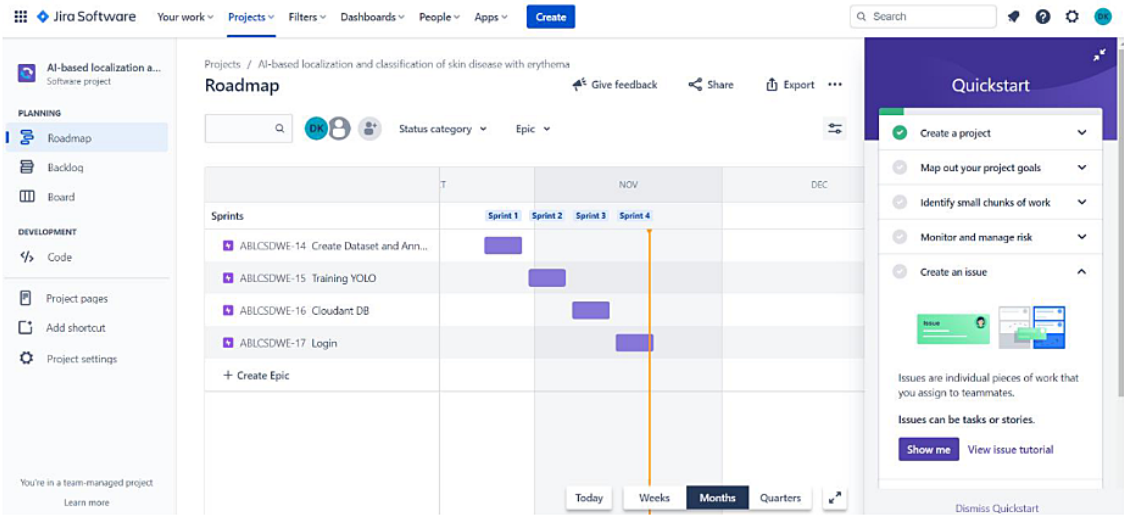
6.2 SPRINT DELIVERY PLAN

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Create Dataset and Annotate Images	USN-1	Create the dataset with 50 images perskin disease.Annotate images using Microsoft VOTT .	20	High	Brundha G, Dharany M
Sprint-2	Training YOLO	USN-2	Download and convert pre-trained weights. Train Yolov3 detector and build the source code.	20	High	Chitra S, Divya K
Sprint-3	Cloudant DB	USN-3	Create cloud account, create serviceinstance, launch cloudant DB and create the database.	20	Low	Brundha G, Divya K
Sprint-4	Login	USN-4	As a user, I can login into the application.		Medium	Chitra S , Dharany M
Sprint-5		USN-5	As a user I can upload skin images as input	20	High	Brundha G, Chitra S
Sprint-6		USN-6	As an admin I can track the skin condition of the user and recommend medication for the user and as a user I can logout successfully.	20	Medium	Dharany M, Divya K

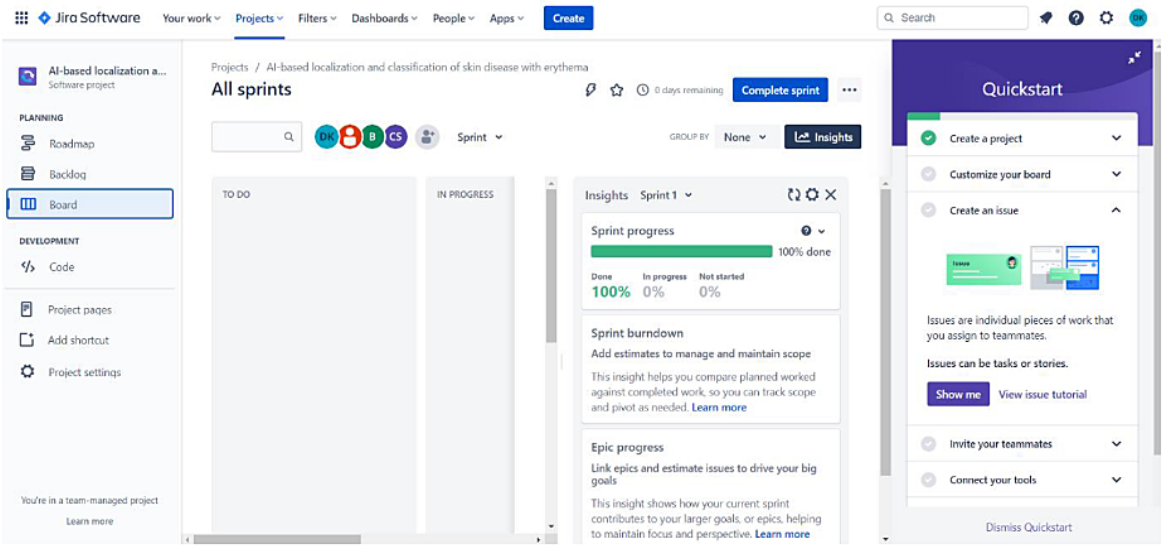
6.3 PROJECT PLANNING USING JIRA SOFTWARE

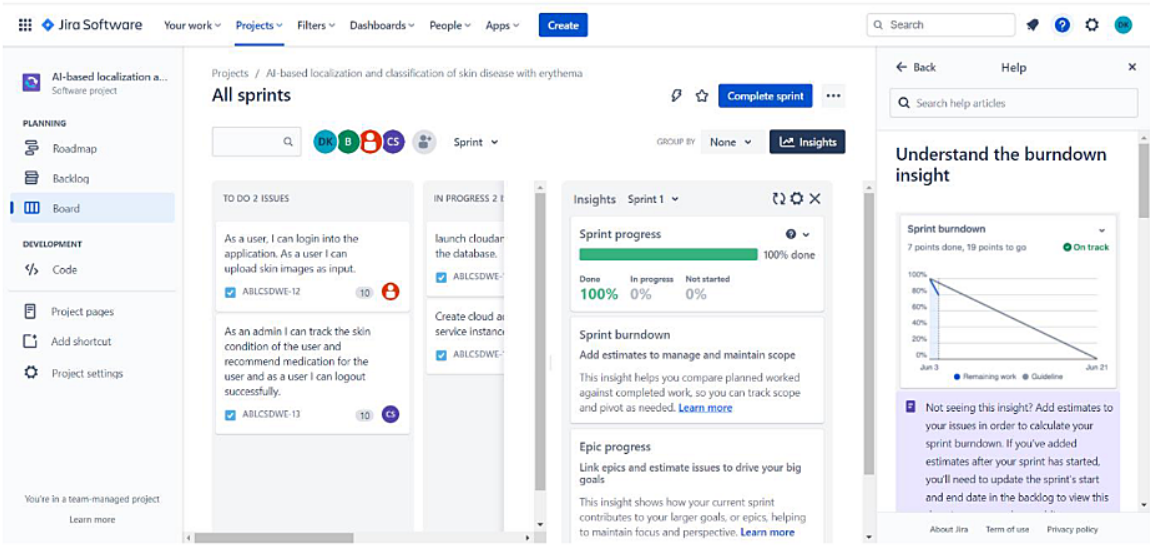
ROAD MAP:

Using jira software

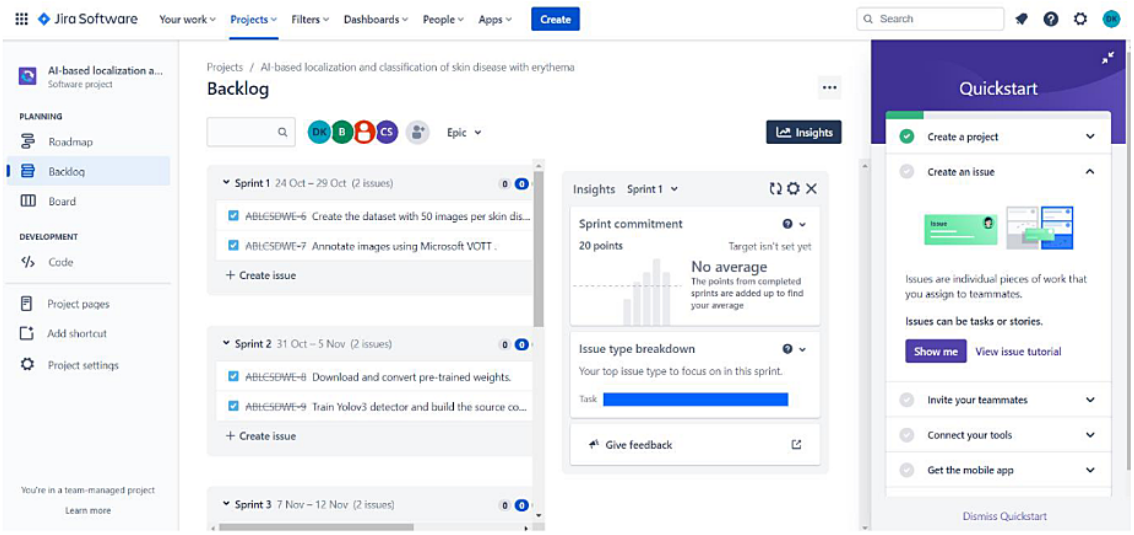


BURNDWN CHART:





VELOCITY CHART:



CHAPTER 7

CODING & SOLUTIONING

Download and convert YOLO weights

```
import os
import subprocess
import time
import sys
import argparse
import requests
import progressbar

FLAGS = None

root_folder = os.path.dirname(os.path.abspath(__file__))
download_folder = os.path.join(root_folder, "src", "keras_yolo3")

if __name__ == "__main__":
```

```
    # Delete all default flags
    parser =
argparse.ArgumentParser(argument_default=argparse.SUPPRESS)
    """
    Command line options
    """
    parser.add_argument(
        "--download_folder",
        type=str,
        default=download_folder,
        help="Folder to download weights to. Default is " +
download_folder,
    )

    FLAGS = parser.parse_args()

    url = "https://pjreddie.com/media/files/yolov3.weights"
    r = requests.get(url, stream=True)

    f = open(os.path.join(download_folder, "yolov3.weights"), "wb")
    file_size = int(r.headers.get("content-length"))
    chunk = 100
    num_bars = file_size // chunk
    bar = progressbar.ProgressBar(maxval=num_bars).start()
    i = 0
    for chunk in r.iter_content(chunk):
        f.write(chunk)
        bar.update(i)
        i += 1
    f.close()

    call_string = "python convert.py yolov3.cfg yolov3.weights
yolo.h5"

    subprocess.call(call_string, shell=True, cwd=download_folder)
```

RUN THE APPLICATION

ABOUT PROJECT

ABOUT PROJECT

Problem

Skin diseases include all conditions that irritate, clog or damage your skin, as well as skin cancer. You may inherit a skin condition or develop a skin disease. Many skin diseases cause itchiness, dry skin or rashes. Often, you can manage these symptoms with medication, proper skin care and lifestyle changes.Skin disorders vary greatly in symptoms and severity. They can be temporary or permanent, and may be painless or painful. Some have situational causes, while others may be genetic. Some skin conditions are minor, and others can be life-threatening.

Solution

Skin diseases are conditions that affect your skin. These diseases may cause rashes, inflammation, itchiness or other skin changes. Some skin conditions may be genetic, while lifestyle factors may cause others. Skin disease treatment may include medications, creams or ointments, or lifestyle changes.

CLASSFICATION

erythema multiforme

erythema nodosum

melanoma

psoriasis

rosacea

A skin disease detection and classification system is a system used for detecting whether a disease is present or not, and then classifying the type of disease, if present. The classification is based on decisions taken using the features extracted through the feature extraction methods.

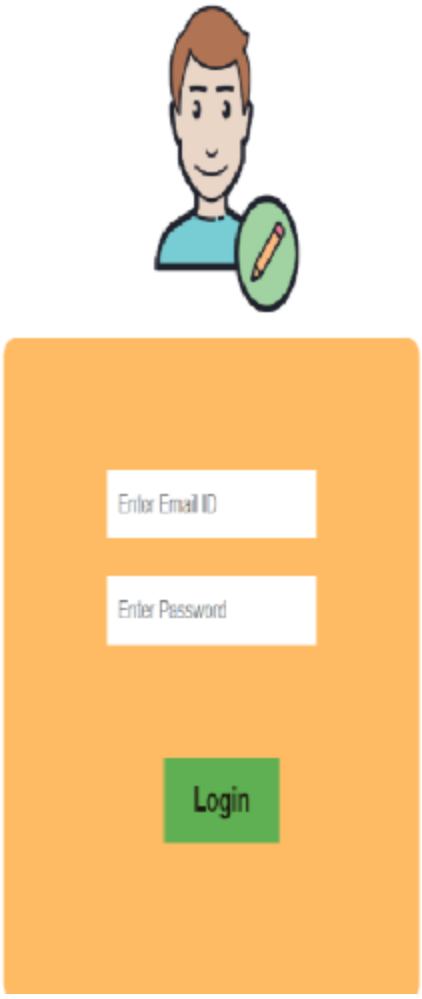
Enter Your Name

Enter Email ID

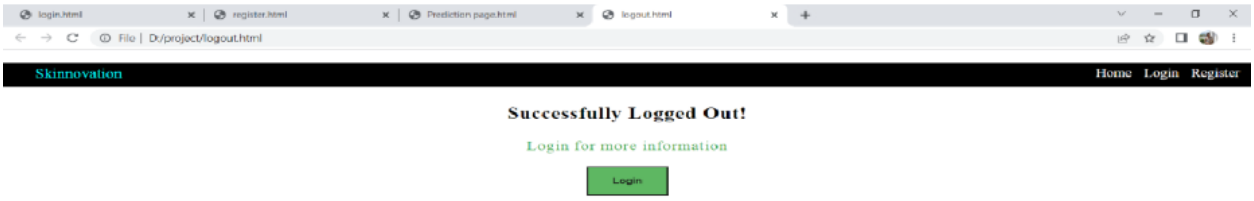
Enter Password

Register

Already have an account? Login


Enter Email ID
Enter Password
Login

LOG OUT PAGE


login.html
register.html
Prediction page.html
logout.html
File | D:/project/logout.html
Skinnovation
Home Login Register
Successfully Logged Out!
Login for more information
Login

Skinnovation-AI-Based localization and classification of skindiseases with erythema

Nowadays 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 devastating skin cancer.If skin diseases are not treated at an earlier state,then it may lead to complications in the body including spreading of the infection from one individual to the other.This skin disease can be prevented by quarantining the infected region at an early stage.The characteristic of the skin images is diversified so there is a challenging job to devise an efficient and robust algorithm for automatic detection of skin diseases and its severity.Skin tone and skin colour play an important role in skin diseases detection.Color and coarseness of skin are visually different.Automatic processing of such images for skin analysis requires quantitative discriminators to differentiate the disease.

CHAPTER 8

ADVANTAGES & DISADVANTAGES

ADVANTAGES

It defines a more powerful and more useful computers.

It introduces a new and improved interface for human interaction

It handles the information better than humans.

YOLO will detect the images

DISADVANTAGES

The implementation cost of AI is very high

Machines can easily lead to destruction if the implementation of machine put in the wrong hands the results are hazardous for human beings.

Sometimes it gives wrong information.

CHAPTER 9

CONCLUSION

Skin diseases are a bit like the common cold. They vary enormously from mild conditions which may affect only the appearance of the skin to severe diseases which are totally incapacitating. The degree of treatment, or even sought,various accordingly.

CHAPTER 10

FUTURE SCOPE

AI in Cyber Security

Cybersecurity is another field that's benefitting from AI. As organizations are transferring their data to IT networks and cloud, the threat of hackers is becoming more significant.

AI in Data Analysis

Data analysis can benefit largely from AI and ML. AI algorithms are capable of improving with iterations, and this way, their accuracy, and precision increase accordingly. AI can help data analysts with handling and processing large datasets.

AI in Home

AI has found a special place in people’s homes in the form of Smart Home Assistants. Amazon Echo and Google Home are popular smart home devices that let you perform various tasks with just voice commands.

AI in Healthcare

The medical sector is also using this technology for its advantages. AI is helping medical researchers and professionals in numerous ways.

AI in Education

The importance of education in this world has been prevalent, but it continues to grow even today. With a large part of the country’s population being the youth, it is important that they receive a good quality education. Along with that, it is also necessary that they understand AI and its benefits. Just like all the other sectors, it is critical for the education sector to keep up with AI as well as the artificial intelligence scope keeps increasing to fuel the education sector.

GITHUB

https://github.com/IBM-EPBL/IBM-Project-2250-1658468095

DEMO LINK

https://youtu.be/Xnre02c1TZU