AI-BASED LOCALIZATION AND CLASSIFICATION OF SKIN DISEASE WITH ERYTHEMA

Team ID: PNT2022TMID44903

TEAM LEADER: NIVEDHA P (811019104025)

TEAM MEMBER: ELAKKIYA R (811019104010)

TEAM MEMBER: GOPIKA V (811019104012)

TEAM MEMBER: MONISHA M (811019104021)

Table of Contents

List of Figures

INTRODUCTION

1.1 Overview

Erythema is the redness of the skin or mucous membranes, caused by hyperemia in the superficial capillaries. If these diseases are not treated at an early stage, they can cause complications in the body, including the spread of infection from one person to another. The skin diseases can be prevented by investigating the infected region at an early stage. The characteristics of the skin images are diversified, so it is a challenging job to devise an efficient and robust algorithm for the automatic detection of skin disease and its severity. Skin tone and skin color play an important role in skin disease detection. The color and coarseness of skin are visually different. Automatic processing of such images for skin analysis requires a quantitative discriminator to differentiate the diseases.

1.2 Purpose

To overcome the above problem, we are building an AI-based model that is used for the prevention and early detection of erythema. Basically, skin disease diagnosis depends on different characteristics like colour, shape, texture, etc. Here, the user can capture images of their skin, which are then sent to the trained model, where the information is processed using image processing techniques and then extracted for machine interpretation. The pixels in the image can be manipulated to achieve any desired density and contrast. Finally, the model generates a result and determines whether or not the person has skin disease. Image processing technologies significantly reduce the time spent on a specific activity by the customer. Hence, it is a time- and money-saving process.

LITRATURE SURVEY

2.1 Existing Problem

The Yolo v3 detector is the primary method for pre-screening skin lesions and detecting erythema. YOLO is an algorithm that detects and recognizes various objects in real-time pictures. Object detection in YOLO is done as a regression problem and provides the class probabilities of the detected images. The YOLO algorithm employs convolutional neural networks (CNN) to detect objects in real-time. The algorithm requires only a single forward propagation through a neural network to detect objects. This means that prediction for the entire image is done in a single algorithm run. The CNN is used to predict various class probabilities and bounding boxes simultaneously. Yolo-V3 boasts good performance over a wide range of input resolutions.

2.2 References

https://creativecommons.org/licenses/by-nc-nd/4.0/
www.nature.com/scientificreports
www.elsevier.com/locate/procedia
https://doi.org/10.1186/s42492-022-00103-6

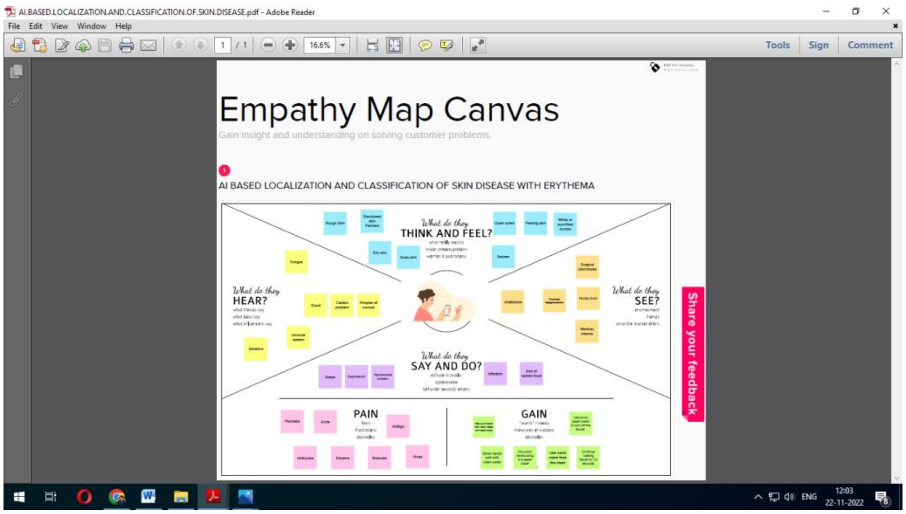
2.3 Problem Statement Definition

To build a model that predicts skin diseases that can be prevented by investigating the infected region. Here, the skin tone and skin colour play an important role in skin disease detection. The person can capture images of their skin, and then the image will be sent to a trained model, which analyses the image and detects whether the person has a skin disease or not.

IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas

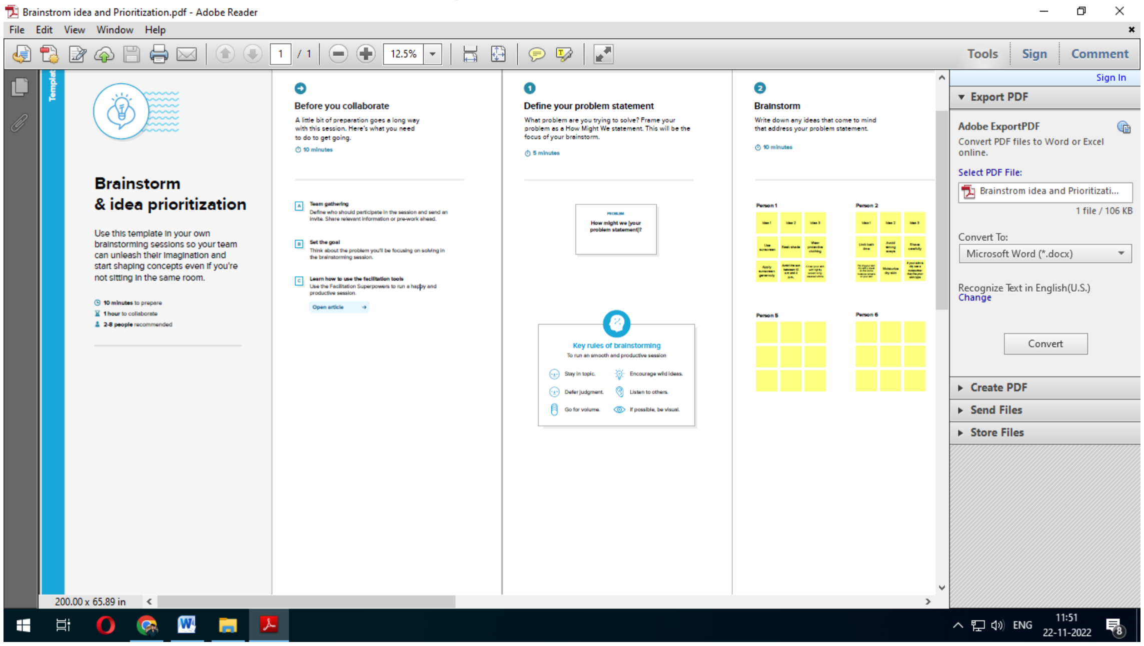
Empathy Map Canvas: An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviors and attitudes. It is a useful tool to helps teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.



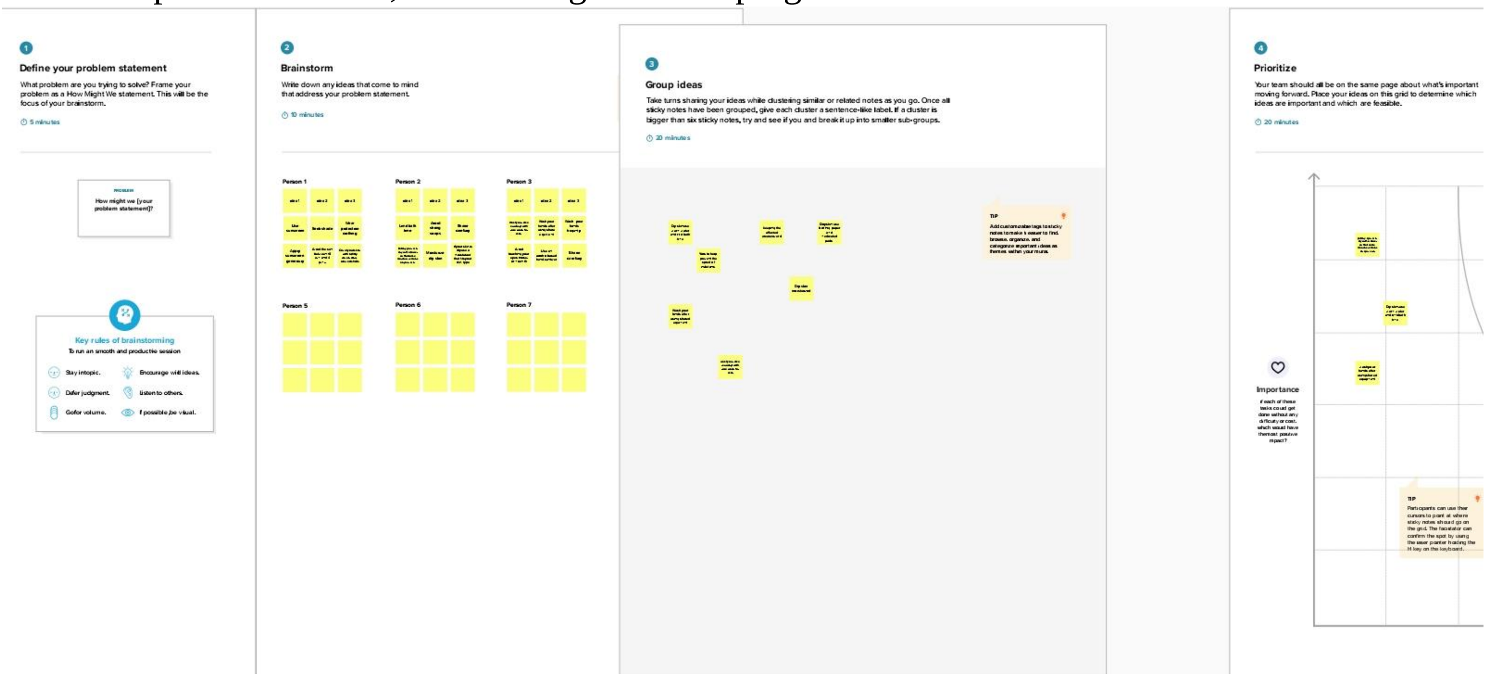
3.2 Ideation & Brainstorming

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions.

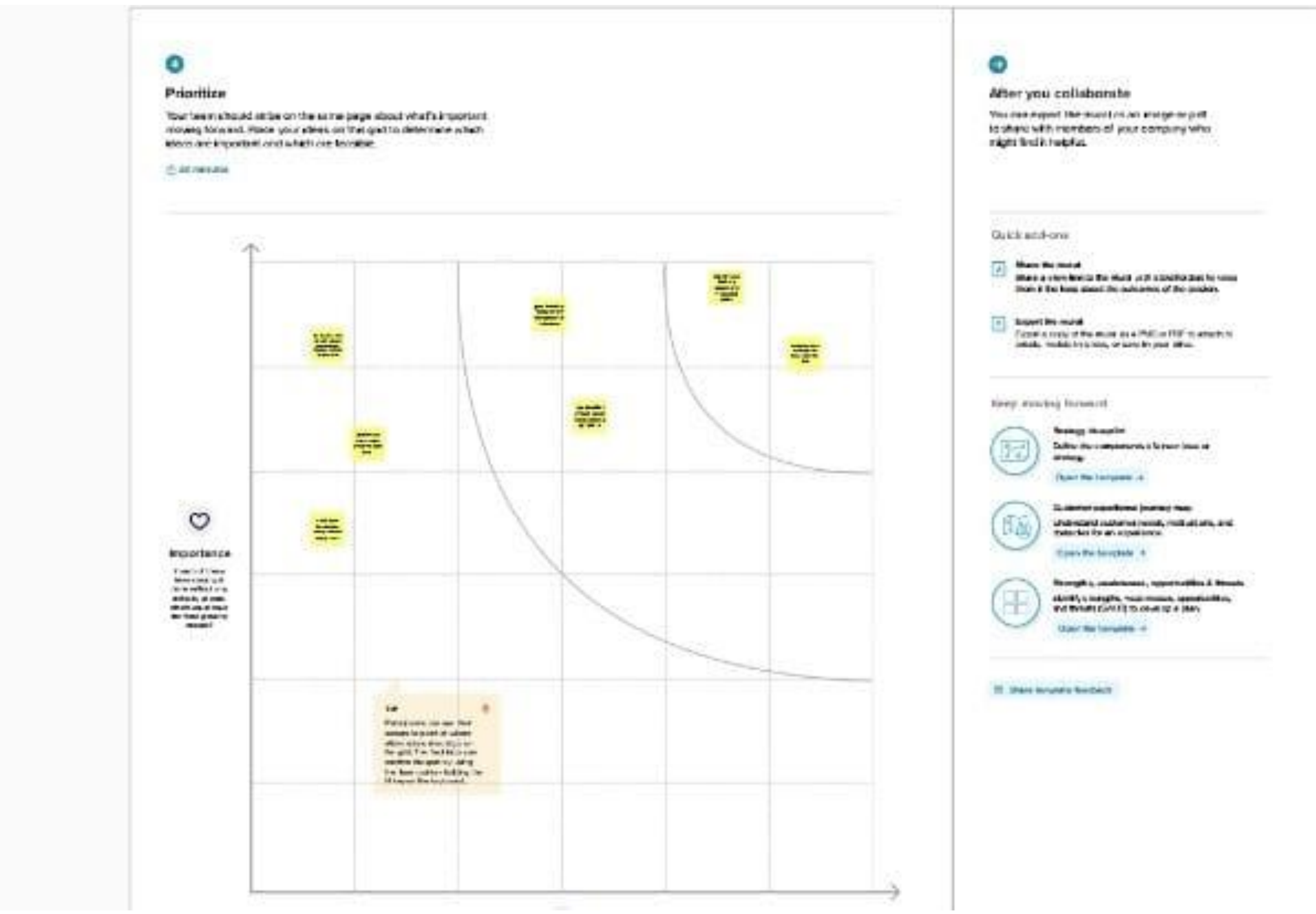
Step-1: Team Gathering, Collaboration and Select the Problem Statement



Step-2: Brainstorm, Idea Listing and Grouping



Step-3: Idea Prioritization

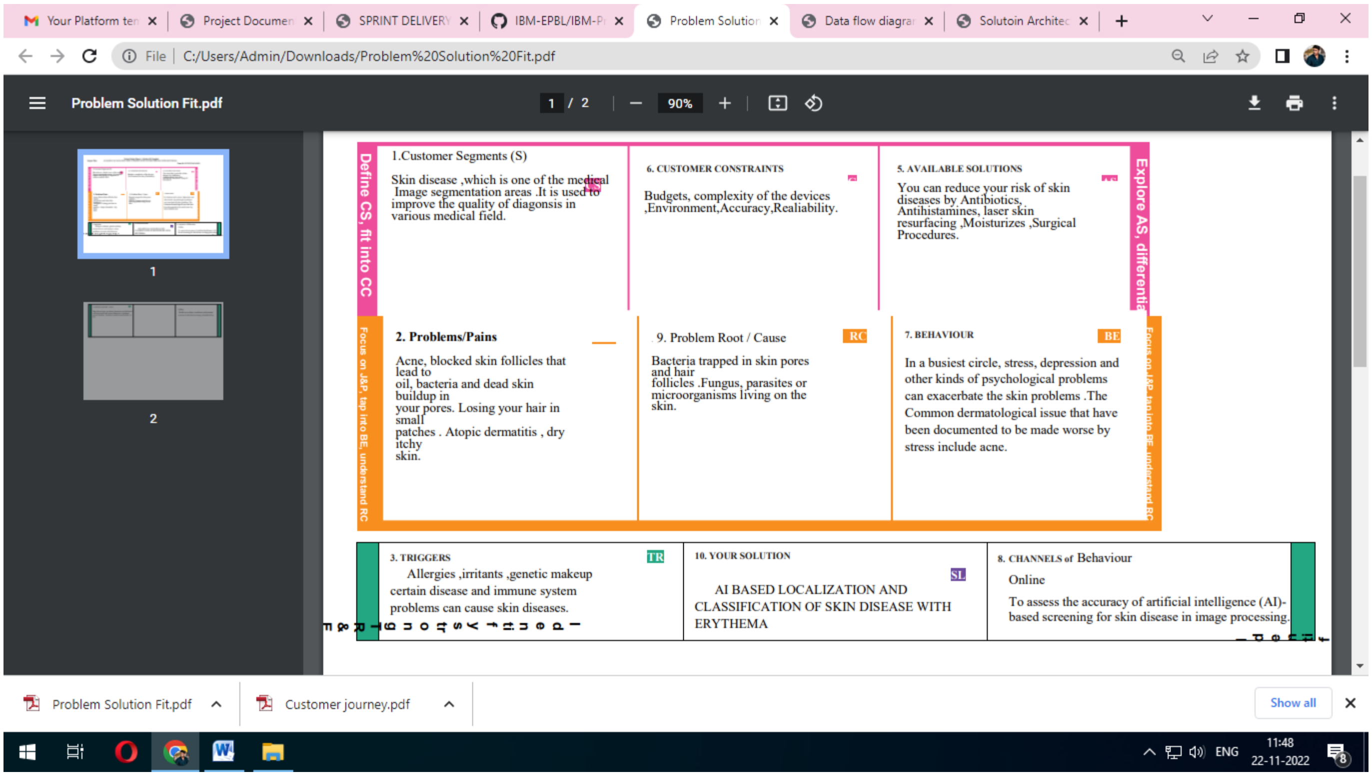


3.3 Proposed Solution

To overcome the problems due to Erythema, we are building an AI- model that is used for the early detection and prevention of Erythema by investigating the infected region.

S. No.	Parameter	Description
1	Problem Statement (Problem to be solved)	It is used to recover users depressive symptoms, social isolation, loneliness and lower quality of life.
2	Idea / Solution description	. People easy to use any time and Any where.
3	Novelty / Uniqueness	Identify the disease to easy.
4	Social Impact / Customer Satisfaction	Time reduce for patient get for quick confirmation.
5	Business Model (Revenue Model)	I think private equity has nicely provided a business model with demonstrated success that we should now adopt. The used technology is Dermatology.
6	Scalability of the Solution	This application was use measure the disease.

3.4 Problem Solution Fit



REQUIREMENT ANALYSIS

4.1 Functional Requirements

FR. No.	Functional Requirement (Epic)	Sub Requirement (Story /Sub-Task)
1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
2	User Confirmation	Confirmation via Email Confirmation via OTP
3	User Profile	User will provide their medical details and save in the system
4	User Uploads Images (Input)	User capture the skin which is affected or upload the taken image as jpeg format
5	Output Analysis	Image will be processed through YOLO and other trained model
6	Provides Description	Gives detailed description of type of the skin disease affected

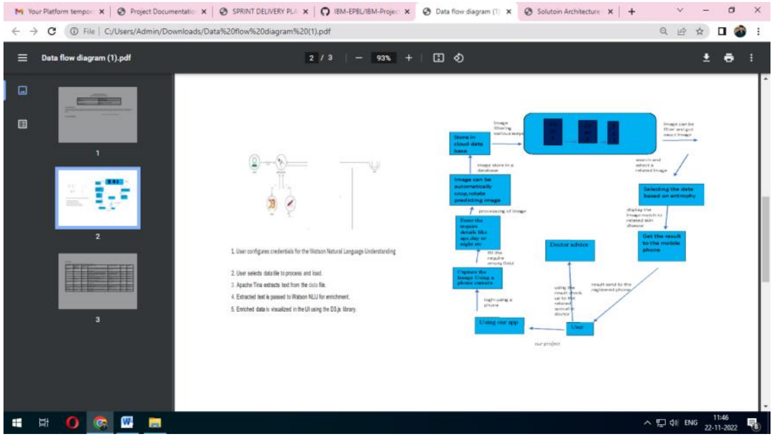
4.2 Non-functional Requirements

NFR No.	Non-Functional Requirement	Description
1	Usability	Used to classify skin disease with erythema
2	Security	It offers greater security and prevents unauthorized users to access the data.
3	Reliability	Even with more users, there will be a good performance without failure.
4	Performance	Performance is very high and it provides result with high accuracy and precision.
5	Availability	With a good system, all authorised users can access and view the medical reports of patients.
6	Scalability	Performance will be good even with high user traffic.

PROJECT DESIGN

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.

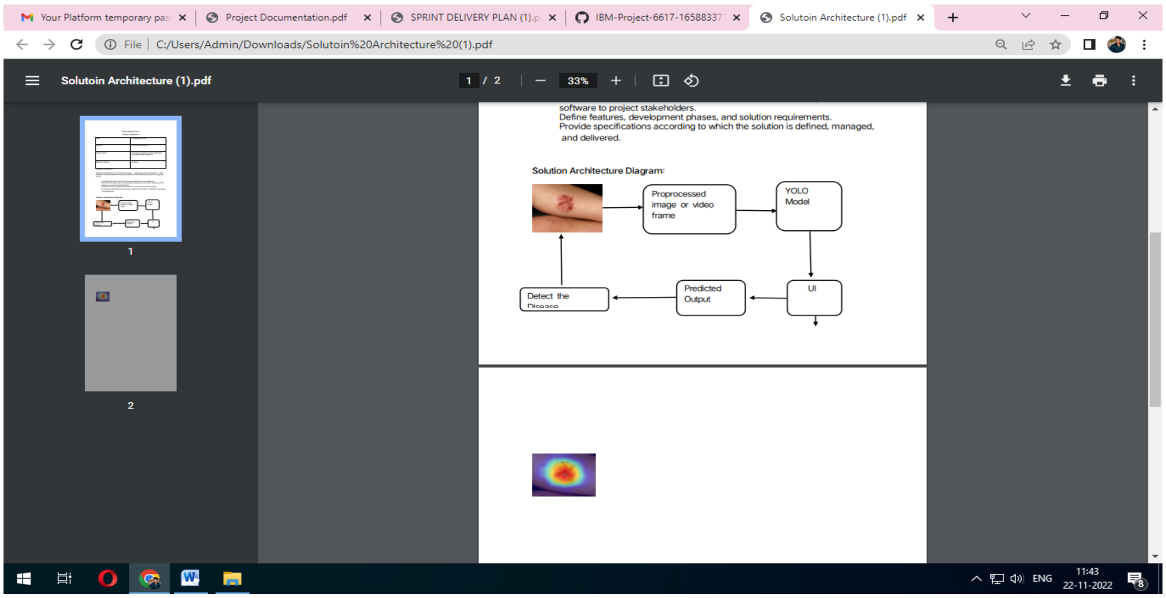


5.2 Solution Architecture

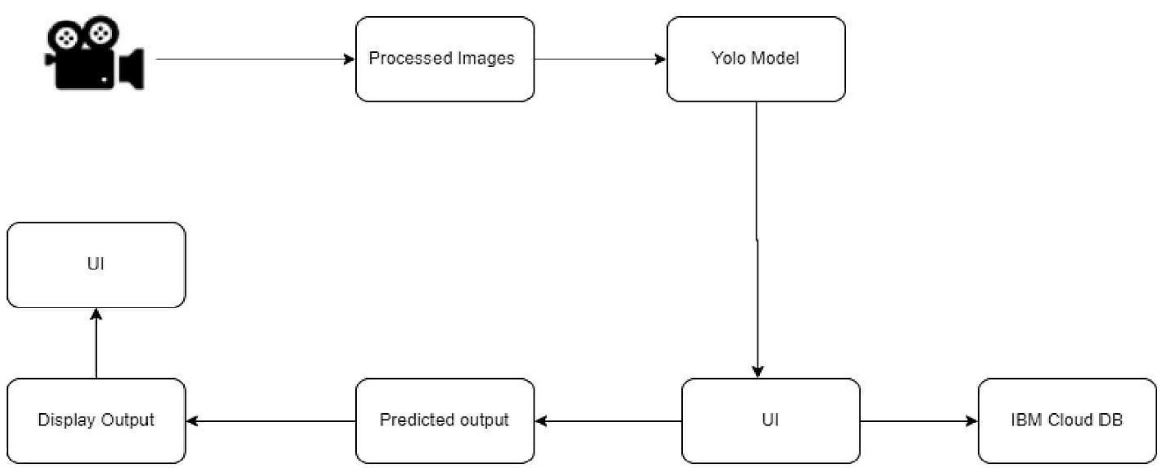
Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behaviour, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, and delivered.

Solution Architecture Diagram:



Technical Architecture:



5.3 User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer	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 login for the application through Gmail	I can register using a gmail.	medium	Sprint-1
	Login	USN-4	As a user, I can log into the application by entering email & password	I can use a login id and password.	high	Sprint-1
	Dashboard	USN-5	As a user,I can see the configuration in a dashboard and use them.	I can use a all features In dashboard.	medium	Sprint-2
Customer (web user)	Register	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
	Login	USN-2	As a user, I can log into the site by entering email & password.	I can use a login id and password.	high	Sprint-1
Customer Care Executive	Suggest a doctor	USN-2	Depend upon the skin disease the doctor can be suggested.	Suggest a specialist Doctor.	Medium	Sprint-2
Administrator	Maintain	USN-1	A data given by a users are maintain by a Administrator.	Data is keep in safe.	high	Sprint-1

PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Product Backlog, 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, I can register for the application by entering my email ,password, and confirmingmy password.	3	High	NIVEDHA P ELAKKIYA R GOPIKA V MONISHA M
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	NIVEDHA P ELAKKIYA R GOPIKA V MONISHA M
Sprint-2		USN-3	As a user, I can register for the application through mobile number.	2	Medium	NIVEDHA P ELAKKIYA R GOPIKA V MONISHA M
Sprint-2		USN-4	As a user. I will receive confirmation SMS	2	High	NIVEDHA P ELAKKIYA R GOPIKA V MONISHA M
Sprint-2	Login	USN-5	As a user, I can log into the application by entering login credentials	1	Medium	NIVEDHA P ELAKKIYA R GOPIKA V MONISHA M
Sprint-3	Dashboard	USN-6	As a user, I can upload my images and get my details of skin diseases	1	High	NIVEDHA P ELAKKIYA R GOPIKA V MONISHA M
Sprint-1	Logout	USN-7	As a user, I can logout successfully	2	High	NIVEDHA P ELAKKIYA R GOPIKA V MONISHA M
Sprint-4	Feedback	USN-8	As a customer care executive, I can able to interact with all the customer and get their feedback which is used to enhance the scope of the project	2	High	NIVEDHA P ELAKKIYA R GOPIKA V MONISHA M

Sprint-4	Classification and prediction	USN-9	The YOLO model classify and predict the type of disease and the area affected.	2	High	NIVEDHA P ELAKKIYA R GOPIKA V MONISHA M

6.2 Sprint Delivery Schedule

Project Tracker, Velocity & Burndown Chart:

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint EndDate (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	07 Nov 2022	20	07 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	14 Nov 2022
Sprint-4	20	6 Days	07 Nov 2022	19 Nov 2022	20	19 Nov 2022

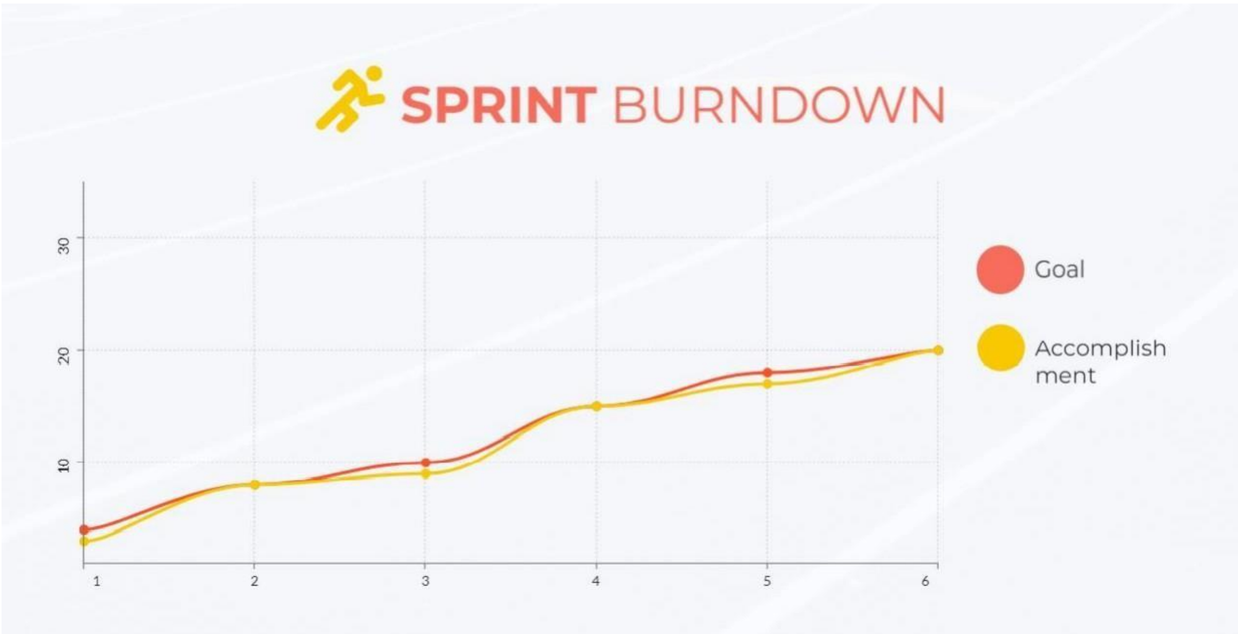
Velocity:

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

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

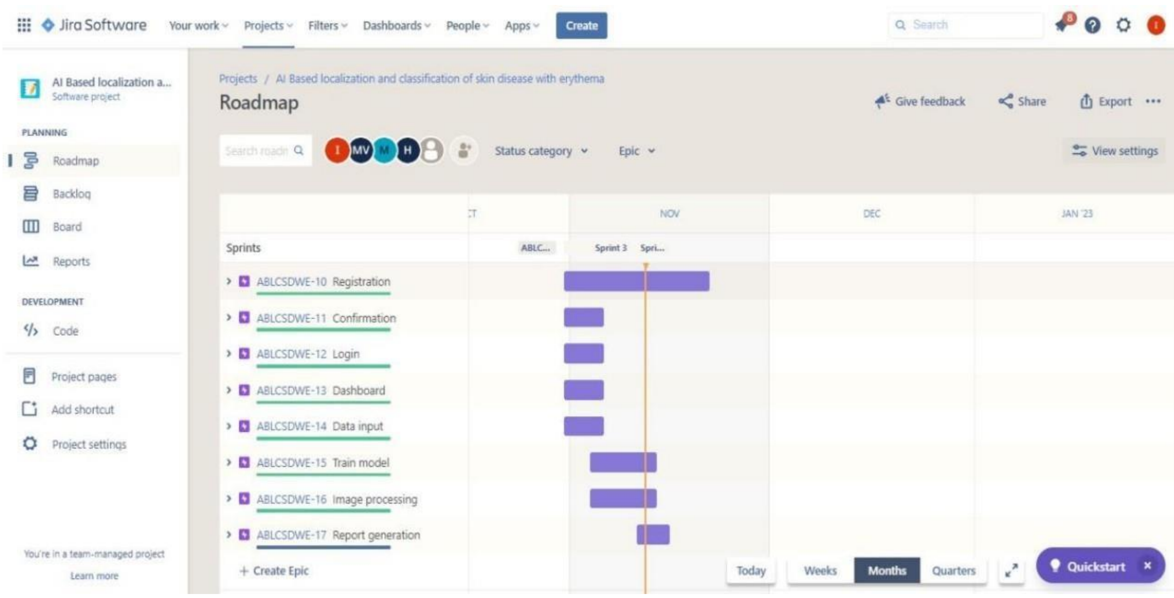
Burndown Chart:

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.

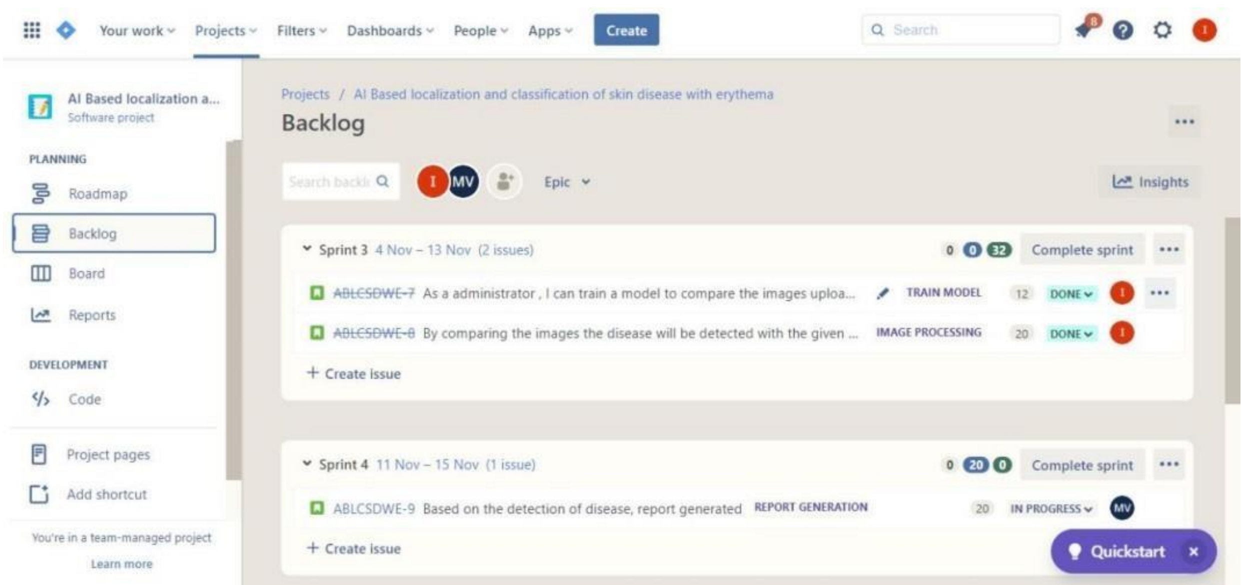


6.4 Reports from JIRA

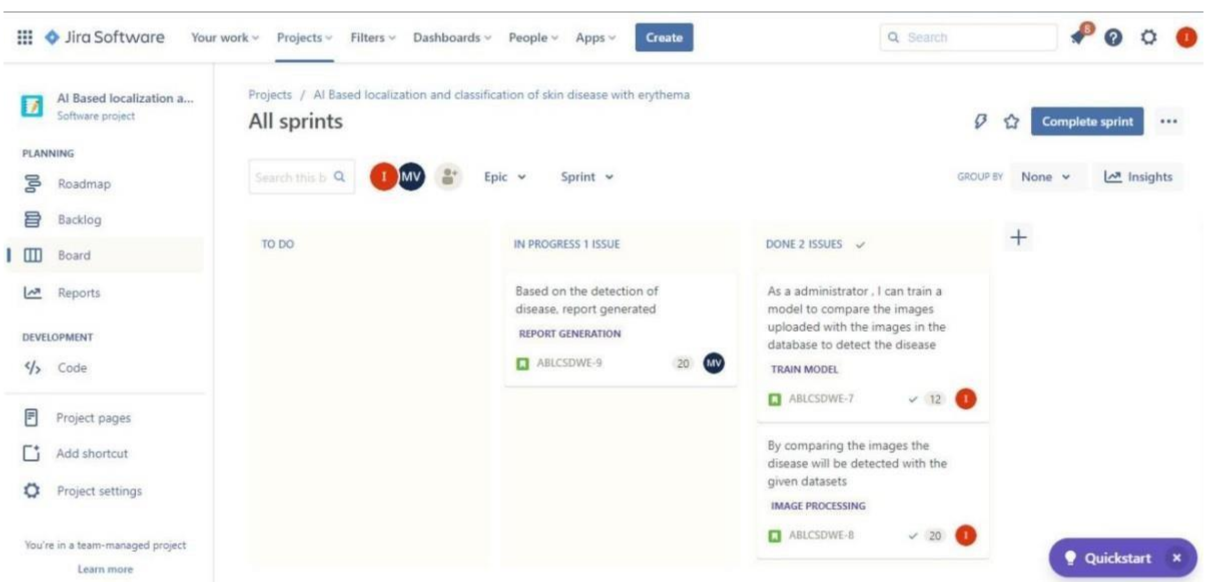
Roadmap:



Backlog:



Board:



CODING & SOLUTIONING

7.1 Feature 1

Annotate Images Our detector needs some high-quality training examples before it can start learning. The images in our training folder are manually labelled using Microsoft's Visual Object Tagging Tool (VoTT). At least 100 images should be annotated for each category to get respectable results. The VoTT csv formatted annotation data is converted to YOLOv3 format by Convert_to_YOLO_format.py file.

Code:

```
from PIL import Image
from is import path, makedirs
import os
 import re
 import pandas as pd
 import sys
import argparse


def get_parent_dir(n=1):
    """ returns the n-the parent directory of the current
    working directory """
    current_path = os.path.dirname(os.path.abspath(__file__))
    for k in range(n):
        current_path = os.path.dirname(current_path)
    return current_path


sys.path.append(os.path.join(get_parent_dir(1), "Utils"))
from Convert_Format import convert_vott_csv_to_yolo
```

```
Data_Folder = os.path.join(get_parent_dir(1), "Data")
VoTT_Folder = os.path.join(
    Data_Folder, "Source_Images", "Training_Images", "vott-csv-export"
)
VoTT_csv = os.path.join(VoTT_Folder, "Annotations-export.csv")
YOLO_filename = os.path.join(VoTT_Folder, "data_train.txt")

model_folder = os.path.join(Data_Folder, "Model_Weights")
classes_filename = os.path.join(model_folder, "data_classes.txt")

if___name___== "__main__":
    # surpress any inhereted default values
    parser = argparse.ArgumentParser(argument_default=argparse.SUPPRESS)
    """
    Command line options
    """
    parser.add_argument(
        "--VoTT_Folder",
        type=str,


        default=VoTT_Folder,
        help="Absolute path to the exported files from the image tagging step with
VoTT. Default is "
        + VoTT_Folder,
    )
```

```
    parser.add_argument(
        "--VoTT_csv",
        type=str,
        default=VoTT_csv,
        help="Absolute path to the *.csv file exported from VoTT. Default is "
        + VoTT_csv,
    )
    parser.add_argument(
        "--YOLO_filename",
        type=str,
        default=YOLO_filename,
        help="Absolute path to the file where the annotations in YOLO format should be
saved. Default is "
        + YOLO_filename,
    )

    FLAGS = parser.parse_args()

    # Prepare the dataset for YOLO
    multi_df = pd.read_csv(FLAGS.VoTT_csv)
    labels = multi_df["label"].unique()
    labeldict = dict(zip(labels, range(len(labels))))
    multi_df.drop_duplicates(subset=None, keep="first", inplace=True)
    train_path = FLAGS.VoTT_Folder
    convert_vott_csv_to_yolo(
        multi_df, labeldict, path=train_path, target_name=FLAGS.YOLO_filename
```

```
    )

    # Make classes file
    file = open(classes_filename, "w")

    # Sort Dict by Values
    SortedLabelDict = sorted(labeldict.items(), key=lambda x: x[1])
    for elem in SortedLabelDict:
        file.write(elem[0] + "\n")
    file.close()
```

7.2 Feature 2

Training Yolo

To prepare for the training process, convert the YOLOv3 model to the Keras format. The YOLOv3 Detector can then be trained by Train_YOLO.py file.

Code:

```
import  os
import sys
import argparse
import warnings

def get_parent_dir(n=1):
    """ returns the n-th parent directory of the current
    working directory """
    current_path = os.path.dirname(os.path.abspath(__file__))
    for k in range(n):
        current_path = os.path.dirname(current_path)
    return current_path
```

```
src_path = os.path.join(get_parent_dir(0), "src")
sys.path.append(src_path)

utils_path = os.path.join(get_parent_dir(1), "Utils")
sys.path.append(utils_path)

import numpy as np
import keras.backend as K
from keras.layers import Input, Lambda
from keras.models import Model
from keras.optimizers import Adam
from keras.callbacks import (
    TensorBoard,
    ModelCheckpoint,
    ReduceLROnPlateau,
    EarlyStopping,
)
from keras_yolo3.yolo3.model import (
    preprocess_true_boxes,
    yolo_body,
    tiny_yolo_body,
    yolo_loss,
)
from keras_yolo3.yolo3.utils import get_random_data
from PIL import Image
from time import time
```

```
import tensorflow.compat.v1 as tf
import pickle

from Train_Utils import (
    get_classes,
    get_anchors,

create_model,
    create_tiny_model,
    data_generator,
    data_generator_wrapper,
    ChangeToOtherMachine,
)



keras_path = os.path.join(src_path, "keras_yolo3")
Data_Folder = os.path.join(get_parent_dir(1), "Data")
Image_Folder = os.path.join(Data_Folder, "Source_Images", "Training_Images")
VoTT_Folder = os.path.join(Image_Folder, "vott-csv-export")
YOLO_filename = os.path.join(VoTT_Folder, "data_train.txt")

Model_Folder = os.path.join(Data_Folder, "Model_Weights")
YOLO_classname = os.path.join(Model_Folder, "data_classes.txt")

log_dir = Model_Folder
anchors_path = os.path.join(keras_path, "model_data", "yolo_anchors.txt")
weights_path = os.path.join(keras_path, "yolo.h5")
```

```
FLAGS = None

if __name__ == "__main__":
    # Delete all default flags
    parser = argparse.ArgumentParser(argument_default=argparse.SUPPRESS)
    """
    Command line options
    """

    parser.add_argument(
        "--annotation_file",
        type=str,
        default=YOLO_filename,
        help="Path to annotation file for Yolo. Default is " + YOLO_filename,
    )
    parser.add_argument(
        "--classes_file",
        type=str,
        default=YOLO_classname,
        help="Path to YOLO classnames. Default is " + YOLO_classname,
    )

    parser.add_argument(
        "--log_dir",
        type=str,
        default=log_dir,
```

```
    help="Folder to save training logs and trained weights to. Default is "
    + log_dir,
)

parser.add_argument(
    "--anchors_path",
    type=str,
    default=anchors_path,

    help="Path to YOLO anchors. Default is " + anchors_path,
)

parser.add_argument(
    "--weights_path",
    type=str,
    default=weights_path,
    help="Path to pre-trained YOLO weights. Default is " + weights_path,
)
parser.add_argument(
    "--val_split",
    type=float,
    default=0.1,
    help="Percentage of training set to be used for validation. Default is 10%.",
)
parser.add_argument(
    "--is_tiny",
    default=False,
```

```
        action="store_true",
        help="Use the tiny Yolo version for better performance and less accuracy. Default is False.",
    )
    parser.add_argument(
        "--random_seed",
        type=float,
        default=None,
        help="Random seed value to make script deterministic. Default is 'None', i.e. non-deterministic.",
    )
    parser.add_argument(
        "--epochs",
        type=float,
        default=51,
        help="Number of epochs for training last layers and number of epochs for fine-tuning layers. Default is 51.",
    )
    parser.add_argument(
        "--warnings",
        default=False,
        action="store_true",
        help="Display warning messages. Default is False.",
    )

    FLAGS = parser.parse_args()
```

```
    if not FLAGS.warnings:
        tf.logging.set_verbosity(tf.logging.ERROR)
        os.environ['TF_CPP_MIN_LOG_LEVEL']='3'
        warnings.filterwarnings("ignore")

    np.random.seed(FLAGS.random_seed)

    log_dir = FLAGS.log_dir

    class_names = get_classes(FLAGS.classes_file)
    num_classes = len(class_names)
    anchors = get_anchors(FLAGS.anchors_path)
    weights_path = FLAGS.weights_path

    input_shape = (416, 416) # multiple of 32, height, width
    epoch1, epoch2 = FLAGS.epochs, FLAGS.epochs

    is_tiny_version = len(anchors) == 6 # default setting
    if FLAGS.is_tiny:
        model = create_tiny_model(
            input_shape, anchors, num_classes, freeze_body=2,
weights_path=weights_path
        )
    else:
       model = create_model(
            input_shape, anchors, num_classes, freeze_body=2,
weights_path=weights_path
```

```
    ) # make sure you know what you freeze

log_dir_time = os.path.join(log_dir, "{}".format(int(time())))
logging = TensorBoard(log_dir=log_dir_time)
checkpoint = ModelCheckpoint(
    os.path.join(log_dir, "checkpoint.h5"),
    monitor="val_loss",
    save_weights_only=True,
    save_best_only=True,
    period=5,
)
reduce_lr = ReduceLROnPlateau(monitor="val_loss", factor=0.1, patience=3,
verbose=1)
early_stopping = EarlyStopping(
    monitor="val_loss", min_delta=0, patience=10, verbose=1
)

val_split = FLAGS.val_split
with open(FLAGS.annotation_file) as f:
    lines = f.readlines()

# This step makes sure that the path names correspond to the local machine
# This is important if annotation and training are done on different machines (e.g.
training on AWS)
lines = ChangeToOtherMachine(lines, remote_machine="")
np.random.shuffle(lines)
num_val = int(len(lines) * val_split)
```

```
num_train = len(lines) - num_val

# Train with frozen layers first, to get a stable loss.
# Adjust num epochs to your dataset. This step is enough to obtain a decent model.
if True:
    model.compile(
        optimizer=Adam(lr=1e-3),
        loss={
            # use custom yolo_loss Lambda layer.
            "yolo_loss": lambda y_true, y_pred: y_pred
        },
    )

    batch_size = 32
    print(
        "Train on {} samples, val on {} samples, with batch size {}.".format(
            num_train, num_val, batch_size
        )
    )
    history = model.fit_generator(
        data_generator_wrapper(
            lines[:num_train], batch_size, input_shape, anchors, num_classes
        ),
        steps_per_epoch=max(1, num_train // batch_size),
        validation_data=data_generator_wrapper(
            lines[num_train:], batch_size, input_shape, anchors, num_classes
        ),
```

```
        validation_steps=max(1, num_val // batch_size),
        epochs=epoch1,
        initial_epoch=0,
       callbacks=[logging, checkpoint],
    )
    model.save_weights(os.path.join(log_dir, "trained_weights_stage_1.h5"))

    step1_train_loss = history.history["loss"]

    file = open(os.path.join(log_dir_time, "step1_loss.npy"), "w")
    with open(os.path.join(log_dir_time, "step1_loss.npy"), "w") as f:
        for item in step1_train_loss:
            f.write("%s\n" % item)
    file.close()

    step1_val_loss = np.array(history.history["val_loss"])

    file = open(os.path.join(log_dir_time, "step1_val_loss.npy"), "w")
    with open(os.path.join(log_dir_time, "step1_val_loss.npy"), "w") as f:
        for item in step1_val_loss:
            f.write("%s\n" % item)
    file.close()

# Unfreeze and continue training, to fine-tune.
# Train longer if the result is unsatisfactory.
if True:
    for i in range(len(model.layers)):
```

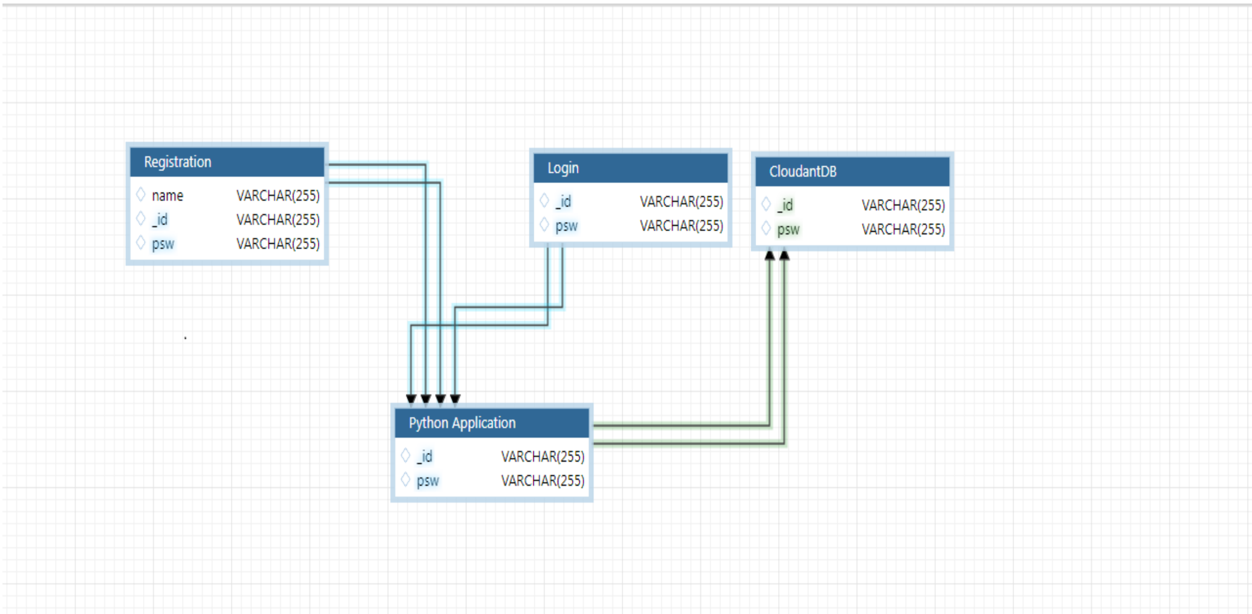
```
    model.layers[i].trainable = True
model.compile(
    optimizer=Adam(lr=1e-4), loss={"yolo_loss": lambda y_true, y_pred: y_pred}
) # recompile to apply the change
print("Unfreeze all layers.")

batch_size = (
    4 # note that more GPU memory is required after unfreezing the body
)
print(
    "Train on {} samples, val on {} samples, with batch size {}.".format(
        num_train, num_val, batch_size
    )
)
history = model.fit_generator(
    data_generator_wrapper(
        lines[:num_train], batch_size, input_shape, anchors, num_classes
    ),
    steps_per_epoch=max(1, num_train // batch_size),
    validation_data=data_generator_wrapper(
        lines[num_train:], batch_size, input_shape, anchors, num_classes
    ),
    validation_steps=max(1, num_val // batch_size),
    epochs=epoch1 + epoch2,
    initial_epoch=epoch1,
    callbacks=[logging, checkpoint, reduce_lr, early_stopping],
)
```

```
model.save_weights(os.path.join(log_dir, "trained_weights_final.h5"))
step2_train_loss = history.history["loss"]

file = open(os.path.join(log_dir_time, "step2_loss.npy"), "w")
with open(os.path.join(log_dir_time, "step2_loss.npy"), "w") as f:
    for item in step2_train_loss:
        f.write("%s\n" % item)
file.close()

step2_val_loss = np.array(history.history["val_loss"])

file = open(os.path.join(log_dir_time, "step2_val_loss.npy"), "w")
with open(os.path.join(log_dir_time, "step2_val_loss.npy"), "w") as f:
    for item in step2_val_loss:
        f.write("%s\n" % item)
file.close()
```

7.3 Database Schema

- Registration: When a new user registers, the backend connects to the IBM Cloudant and stores the user's credentials in the database.
- Login: To check if a user is already registered, the backend connects to Cloudant when they attempt to log in. They are an invalid user if they are not already registered.
- IBM cloudant: Stores the data which is registered.
- app.py: Connects both Frontend and the cloudant for the verification of user credentials

Diagram:


Registration
name VARCHAR(255)
_id VARCHAR(255)
psw VARCHAR(255)
Login
_id VARCHAR(255)
psw VARCHAR(255)
CloudantDB
_id VARCHAR(255)
psw VARCHAR(255)
Python Application
_id VARCHAR(255)
psw VARCHAR(255)

TESTING

8.1 Test Case

Test Case No.	Action	Expected Output	Actual Output	Result
1	Register for the website	Stores name, email, and password in Database	Stores name,email, and password in Database	Pass
2	Login to the website	Giving the right credentials, results in a successful login.	Giving the right credentials, results in a successful login.	Pass
3	Detecting the disease	It should predict the disease	It should predictthe disease	Pass

8.2 User Acceptance Testing

Section	l’otal Cases	Not l’ested	Ïail	Pass
Registration	9	0	0	9
Login	40	0	0	40
Security	2	0	0	2
Disease Detection	10	0	0	10
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

RESULTS

9.1 Performance Metrics

S.No.	Parameter	Values
1.	Model Summary	To evaluate object detection models like R-CNN and YOLO, the mean average precision (mAP) is used. ThemAP compares the ground-truth bounding box to thedetected box and returns a score.
2.	Accuracy	Training Accuracy – 89% Validation Accuracy – 95%
3.	Confidence Score (Only Yolo Projects)	Class Detected – 93% Confidence Score – 90%

ADVANTAGES & DISADVANTAGES

Advantages:

- Image processing technology has enabled more efficient and accurate treatment plans.
- It is time and money-saving process.
- Performance of the model will be good even with the higher user traffic.
- In Image processing, the pixels in the image can be manipulated to any desired density and contrast.
- Since high pixel quality is generated, easy classification of skin disease is possible

Disadvantages:

- AI-Models are Susceptible to security risks.
- Inaccuracies are still possible.
- Although AI has come a long way, human surveillance is still essential.

CONCLUSION

Even without a large dataset and high-quality images, it is possible to achieve sufficient accuracy rates in this AI model. With accurate segmentation, we gain knowledge of the location of the disease, which is useful in the pre-processing of data used in classification as it allows the YOLO model to focus on the area of interest. Our method provides a solution to classifying multiple diseases with higher quality and a larger quantity of data. With the assistance of our AI-based methods, it saves time and money for patients.

FUTURE SCOPE

The future of AI in detecting skin diseases could include tasks that range from simple to complex—everything from answering the phone to medical record review, reading radiology images, making clinical diagnoses and treatment plans, and even talking with patients.AI is already at work, increasing convenience and efficiency, reducing costs and errors, and generally making it easier for more patients to receive the health care they need. While AI is being used in health care, it will become increasingly important for its potential to enhance patient engagement in their own care and streamline patient access to care.

APPENDIX

SOURCE CODE

```
import re
import numpy as np
import os
from flask import Flask, app,request,render_template
import sys
from flask import Flask, request, render_template, redirect, url_for
import argparse
from tensorflow import keras
from PIL import Image
from timeit import default_timer as timer
import test
import pandas as pd
import numpy as np
import random

def get_parent_dir(n=1):
    """ returns the n-th parent dicrectory of the current
    working directory """
    current_path = os.path.dirname(os.path.abspath(__file__))
    for k in range(n):
        current_path = os.path.dirname(current_path)
    return current_path
```

```
src_path =r'C:\Users\MadhuVasanth1606\Desktop\yolo_structure\2_Training\src'
print(src_path)
utils_path = r'C:\Users\MadhuVasanth1606\Desktop\yolo_structure\Utils'
print(utils_path)

sys.path.append(src_path)
sys.path.append(utils_path)

import argparse
from keras_yolo3.yolo import YOLO, detect_video
from PIL import Image
from timeit import default_timer as timer
from utils import load_extractor_model, load_features, parse_input, detect_object
import test
import utils
import pandas as pd
import numpy as np
from Get_File_Paths import GetFileList
import random
os.environ["TF_CPP_MIN_LOG_LEVEL"] = "3"
# Set up folder names for default values
data_folder = os.path.join(get_parent_dir(n=1), "yolo_structure", "Data")
image_folder = os.path.join(data_folder, "Source_Images")
```

```
image_test_folder = os.path.join(image_folder, "Test_Images")

detection_results_folder = os.path.join(image_folder,
"Test_Image_Detection_Results")

detection_results_file = os.path.join(detection_results_folder,
"Detection_Results.csv")

model_folder = os.path.join(data_folder, "Model_Weights")


model_weights = os.path.join(model_folder, "trained_weights_final.h5")

model_classes = os.path.join(model_folder, "data_classes.txt")


anchors_path = os.path.join(src_path, "keras_yolo3", "model_data",
"yolo_anchors.txt")


FLAGS = None


from cloudant.client import Cloudant


# Authenticate using an IAM API key

client = Cloudant.iam('5b73f72f-2449-4298-88e8-3f887f8bbd2d-
bluemix','t3wXXORf8KoIMLzYFX2sk4e22uluSBKhM9-K4Q5b1zuK',
connect=True)


# Create a database using an initialized client

my_database = client.create_database('skindisease')
```

```
app=Flask(__name__)

#default home page or route
@app.route('/')
def index():
    return render_template('index.html')




@app.route('/index.html')
def home():
    return render_template("index.html")

#registration page
@app.route('/register')
def register():
    return render_template('register.html')

@app.route('/afterreg', methods=['POST'])
def afterreg():
    x = [x for x in request.form.values()]
    print(x)
     data = {
    '_id': x[1], # Setting _id is optional
```

```
    'name': x[0],
    'psw':x[2]
    }
    print(data)

    query = {'_id': {'$eq': data['_id']}}

    docs = my_database.get_query_result(query)
    print(docs)

    print(len(docs.all()))

    if(len(docs.all())==0):
        url = my_database.create_document(data)
        #response = requests.get(url)
        return render_template('register.html', pred="Registration Successful, please
login using your details")
    else:
        return render_template('register.html', pred="You are already a member, please
login using your details")

#login page
@app.route('/login')
def login():
    return render_template('login.html')
```

```
@app.route('/afterlogin',methods=['POST'])
def afterlogin():
    user = request.form['_id']
    passw = request.form['psw']
    print(user,passw)

    query = {'_id': {'$eq': user}}

    docs = my_database.get_query_result(query)
    print(docs)

    print(len(docs.all()))



    if(len(docs.all())==0):
        return render_template('login.html', pred="The username is not found.")
    else:
        if((user==docs[0][0]['_id'] and passw==docs[0][0]['psw'])):
            return redirect(url_for('prediction'))
        else:
            print('Invalid User')



@app.route('/logout')
def logout():
```

```
    return render_template('logout.html')


@app.route('/prediction')
def prediction():
    return render_template('prediction.html')



@app.route('/result',methods=["GET","POST"])
def res():
    # Delete all default flags
    parser = argparse.ArgumentParser(argument_default=argparse.SUPPRESS)
    """
    Command line options
    """

    parser.add_argument(
        "--input_path",
        type=str,
        default=image_test_folder,
        help="Path to image/video directory. All subdirectories will be included. Default
is "
        + image_test_folder,
    )

    parser.add_argument(
        "--output",
```

```
        type=str,
        default=detection_results_folder,
        help="Output path for detection results. Default is "
        + detection_results_folder,
    )

    parser.add_argument(
        "--no_save_img",
        default=False,
        action="store_true",
        help="Only save bounding box coordinates but do not save output images with annotated boxes. Default is False.",
    )

    parser.add_argument(
        "--file_types",
        "--names-list",
        nargs="*",
        default=[],
        help="Specify list of file types to include. Default is --file_types .jpg .jpeg .png .mp4",
    )

    parser.add_argument(
        "--yolo_model",
        type=str,
```

```
    dest="model_path",
    default=model_weights,
    help="Path to pre-trained weight files. Default is " + model_weights,
)

parser.add_argument(
    "--anchors",
    type=str,
    dest="anchors_path",
    default=anchors_path,
    help="Path to YOLO anchors. Default is " + anchors_path,
)

parser.add_argument(
    "--classes",
    type=str,
    dest="classes_path",
    default=model_classes,
    help="Path to YOLO class specifications. Default is " + model_classes,
)

parser.add_argument(
    "--gpu_num", type=int, default=1, help="Number of GPU to use. Default is 1"
)
```

```
    parser.add_argument(
        "--confidence",
        type=float,
        dest="score",
        default=0.25,
        help="Threshold for YOLO object confidence score to show predictions. Default is 0.25.",
    )

    parser.add_argument(
        "--box_file",
        type=str,
        dest="box",
        default=detection_results_file,
        help="File to save bounding box results to. Default is "
        + detection_results_file,
    )

    parser.add_argument(
        "--postfix",
        type=str,
        dest="postfix",
        default="_disease",
        help='Specify the postfix for images with bounding boxes. Default is "_disease"',
    )
```

```
FLAGS = parser.parse_args()

save_img = not FLAGS.no_save_img

file_types = FLAGS.file_types
#print(input_path)

if file_types:
    input_paths = GetFileList(FLAGS.input_path, endings=file_types)
    print(input_paths)
else:
    input_paths = GetFileList(FLAGS.input_path)
    print(input_paths)

# Split images and videos
img_endings = (".jpg", ".jpeg", ".png")
vid_endings = (".mp4", ".mpeg", ".mpg", ".avi")

input_image_paths = []
input_video_paths  =  []
for item in input_paths:
    if       item.endswith(img_endings):
        input_image_paths.append(item)
    elif    item.endswith(vid_endings):
        input_video_paths.append(item)
```

```
output_path = FLAGS.output
if not os.path.exists(output_path):
    os.makedirs(output_path)

# define YOLO detector
yolo = YOLO(
    **{
        "model_path": FLAGS.model_path,
        "anchors_path": FLAGS.anchors_path,
        "classes_path": FLAGS.classes_path,
        "score": FLAGS.score,
        "gpu_num": FLAGS.gpu_num,
        "model_image_size": (416, 416),
    }
)

# Make a dataframe for the prediction outputs
out_df = pd.DataFrame(
    columns=[
        "image",
        "image_path",
        "xmin",
        "ymin",
        "xmax",
```

```
        "ymax",
        "label",
        "confidence",
        "x_size",
        "y_size",
    ]
)

# labels to draw on images
class_file = open(FLAGS.classes_path, "r")
input_labels = [line.rstrip("\n") for line in class_file.readlines()]
print("Found {} input labels: {} ...".format(len(input_labels), input_labels))

if input_image_paths:
    print(
        "Found {} input images: {} ...".format(
            len(input_image_paths),
            [os.path.basename(f) for f in input_image_paths[:5]],
        )
    )
    start = timer()
    text_out = ""

    # This is for images
    for i, img_path in enumerate(input_image_paths):
```

```
print(img_path)
prediction, image,lat,lon= detect_object(
    yolo,
    img_path,
    save_img=save_img,
    save_img_path=FLAGS.output,
    postfix=FLAGS.postfix,
)
print(lat,lon)
y_size, x_size, _ = np.array(image).shape
for single_prediction in prediction:
    out_df = out_df.append(
        pd.DataFrame(
            [
                [
                    os.path.basename(img_path.rstrip("\n")),
                    img_path.rstrip("\n"),
                ]
                + single_prediction
                + [x_size, y_size]
            ],
            columns=[
                "image",
                "image_path",
                "xmin",
```

```
                    "ymin",
                    "xmax",
                    "ymax",
                    "label",
                    "confidence",
                    "x_size",
                    "y_size",
                ],
            )
        )
    end = timer()
    print(
        "Processed {} images in {:.1f}sec - {:.1f}FPS".format(
            len(input_image_paths),
            end - start,
            len(input_image_paths) / (end - start),
        )
    )
    out_df.to_csv(FLAGS.box, index=False)

# This is for videos
if input_video_paths:
    print(
        "Found {} input videos: {} ...".format(
            len(input_video_paths),
```

```
            [os.path.basename(f) for f in input_video_paths[:5]],
        )
    )
    start = timer()
    for i, vid_path in enumerate(input_video_paths):
        output_path = os.path.join(
            FLAGS.output,
            os.path.basename(vid_path).replace(".", FLAGS.postfix + "."),
        )
        detect_video(yolo, vid_path, output_path=output_path)

    end = timer()
    print(
        "Processed {} videos in {:.1f}sec".format(
            len(input_video_paths), end - start
        )
    )
  # Close the current yolo session
  yolo.close_session()
  return render_template('prediction.html')

""" Running our application """
if___name___== "__main__":
  app.run(debug=True)
```

GitHub & Project Demo Link

Github: https://github.com/IBM-EPBL/IBM-Project-6617-1658833716

PROJECT DEMOLINK:

../Downloads/DEMO%20VIDEO%20LINK.pdf