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AI-based localization and classification of skin disease with erythema

1.INTRODUCTION

1.1 Project Overview:

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.

1.2 Purpose:

We classify each cluster into different common skin diseases using another neural network model. Our segmentation model achieves better performance compared to previous studies, and also achieves a near-perfect sensitivity score in unfavorable conditions. Our classification model 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.

2.LITERATURE SURVEY

2.1 Existing Problem:

An inherent disadvantage of clustering a skin disease is its lack of robustness against noise. Clustering algorithms rely on the identification of a centroid that can generalize a cluster of data. Noisy data, or the presence of outliers, can significantly degrade the performance of these algorithms. Therefore, with noisy datasets, caused by images with different types of lighting, non-clustering algorithms may be preferred. Owing to the disadvantages of these traditional approaches, convolution neural networks (CNNs) have gained popularity because of their ability to extract high-level features with minimal preprocessing. By learning to accurately create a higher-resolution image, CNNs can determine the location of the targets to segment.

2.2 References:

Doi, K. Computer-aided diagnosis in medical imaging: Historical review, current status and future potential. Comput. Med. Imaging Graph.

Yoshida, H. & Dachman, A. H. Computer-aided diagnosis for CT colonography. Semin. Ultrasound CT MRI

Trabelsi, O., Tlig, L., Sayadi, M. & Fnaiech, F., Skin disease analysis and tracking based on image segmentation. 2013 International Conference on Electrical Engineering and Software Applications, Hammamet, 1–7.'

Rajab, M. I., Woolfson, M. S. & Morgan, S. P. Application of region-based segmentation and neural network edge detection to skin lesions. Comput. Med. Imaging Graph. 28, 61–68.

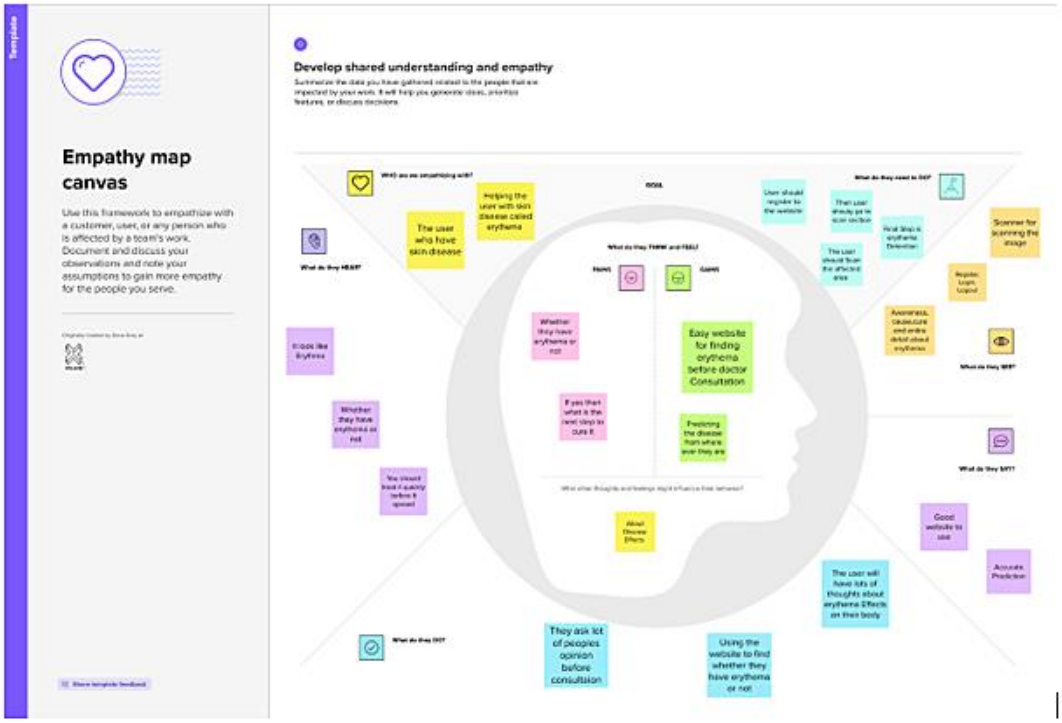
2.3 Problem Statement Definition:

Create a problem statement to understand your customer's point of view. The Customer Problem Statement template helps you focus on what matters to create experiences people will love.

A well-articulated customer problem statement allows you and your team to find the ideal solution for the challenges your customers face. Throughout the process, you'll also be able to empathize with your customers, which helps you better understand how they perceive your product or service.

3. IDEATION AND PROPOSED SOLUTION

3.1 Empathy Map canvas:



3.2 Ideation and Brainstroming:

Template

Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

10 minutes to prepare
1 hour to collaborate
2-8 people recommended

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

A **Team gathering**
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B **Set the goal**
Think about the problem you'll be focusing on solving in the brainstorming session.

C **Learn how to use the facilitation tools**
Use the Facilitation Superpowers to run a happy and productive session.

Open article →

1 Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

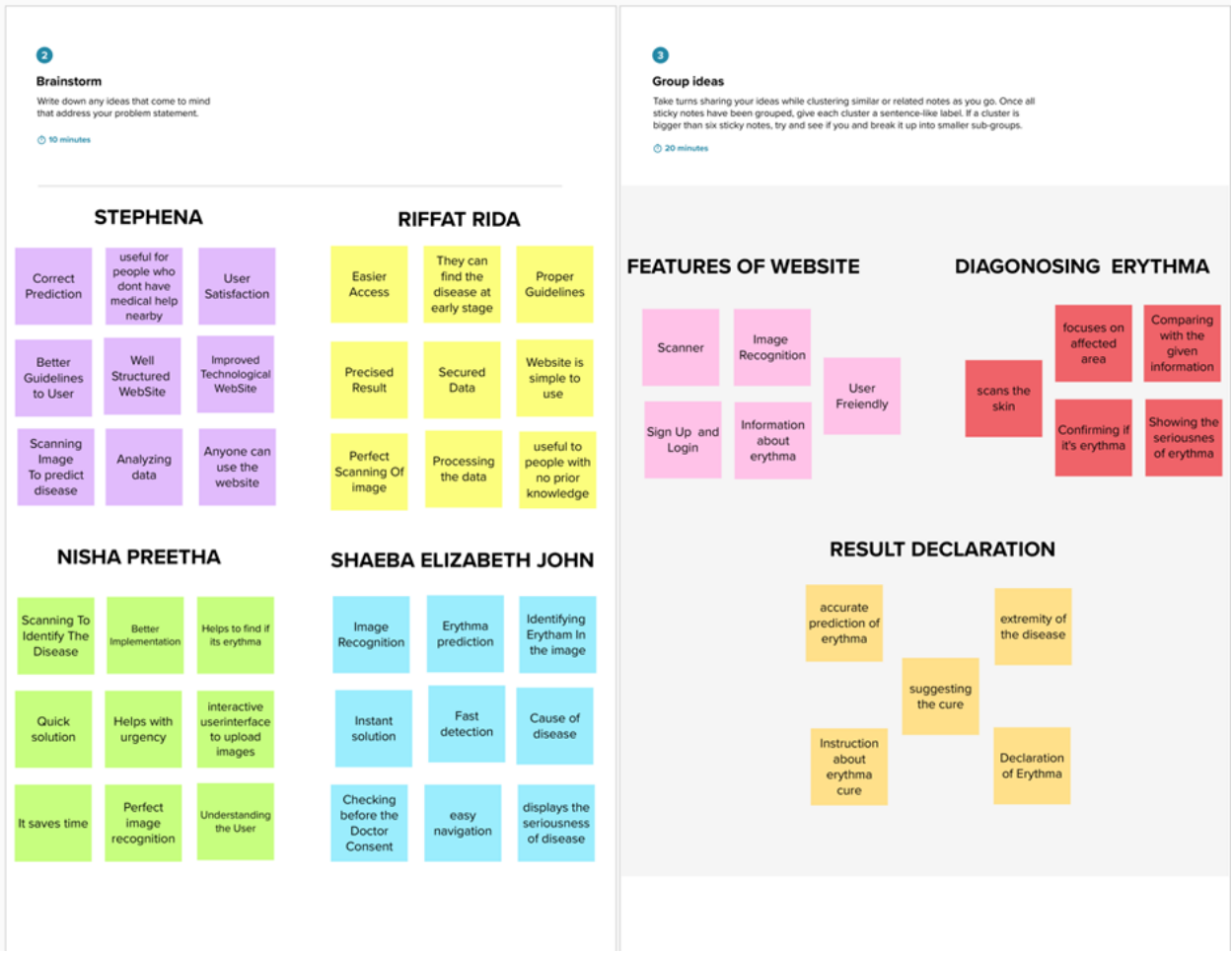
PROBLEM

1.identify the disease on skin using image recognition and to predict the kind of it especilly erythma.

Key rules of brainstorming

To run an smooth and productive session

- Stay in topic.
- Defer judgment.
- Go for volume.
- Encourage wild ideas.
- Listen to others.
- If possible, be visual.



3.3 Proposed solution:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Erythema is redness of the skin caused by injury or another inflammation-causing condition. Often presenting as a rash, erythema can be caused by environmental factors, infection, or overexposure to the sun, early detection alongwith proper medication can significantly improvesymptoms and quality of life.
2.	Idea / Solution description	In This project,we are using Artificial Intelligence(AI) domain to detect the skin disease by scanning the affected area and identifying the kind of erythema.

3.	Novelty / Uniqueness	Here we use YOLO algorithm which divides the image into N grids, each having an equal dimensional region of SxS.Each of these N grids is responsible for the detection and localization of the object it contains using packages like SKYKIT,NUMPY.
4.	Social Impact / Customer Satisfaction	Persistent erythema associated with may negatively impact quality of life (QoL), self-esteem, and self-confidence. We evaluated burden and health-related QoL (HRQoL) impacts of centrofacial erythema.Centrofacial erythema represents a substantial HRQoL burden, especially for those with more severe erythema.
5.	Business Model (Revenue Model)	Early detection with proper medication can significantly improve symtoms and quality of life.Our model can be used in hospitals to detect erythema in early stages and cure it.
6.	Scalability of the Solution	scalability in our project is achieved by using deep learning module which imports the advanced packages and detects the disease by scanning the image region-wise,hence our project allows alteration in accordance with various paramaters of erythema

3.4 Proposed solution Fit:

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

Our customers are patients with skin diseases around all age groups.

The symptoms of skin diseases can be assumed to be that of Erythema.

Furthermore, the symptoms are classified by our application hence,this data is negligible.

6. CUSTOMER CONSTRAINTS CC

The major customer constraints of our project are:

1. Adequate internet connection
2. Suitable and compatible devices
3. Availability of HD-quality camera
4. Images should contain the symptoms to be classified

5. AVAILABLE SOLUTIONS AS

Formerly, For those with Erythema disease are needed to visit a nearby clinic or any medical firm. It is also hard to find the exact remedy for Erythema skin disease. Hence, For more easier and accurate solution, we recommend using our application . It provides the necessary information and remedy at the comfort of our houses.

Explore AS, differentiate

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

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

The problem to which our project gives the solution is the Erythema skin disease. Our customers are patients who seek aid to relieve them from Erythema. Therefore, Our jobs-to-be-done are developing an application that localize and classify the disease easily

9. PROBLEM ROOT CAUSE RC

skin cancer rate is rapidly increasing over the last few decades especially Melanoma is most diversifying skin cancer. By developing this model , we express our contribution to create awareness about the disease and to provide easy access to treat the disease.

7. BEHAVIOUR BE

The skin diseases can be prevented by investigating the infected region at an early stage.

Hence, The affected person looks for necessary medical attention to avoid any further complications

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

Identify strong TR & EM

3. TRIGGERS TR

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. This triggers the patient to consult a specialist immediately.

10. YOUR SOLUTION SL

To overcome the Erythema disease 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 color, shape, texture etc. Here the person can capture the images of skin and then the image will be sent to the trained model. The model analyses the image and detects whether the person is having skin disease or not.

8.CHANNELS of BEHAVIOR CH

8.1 ONLINE

The patient needs to upload a suitable image file into the application.

8.2 OFFLINE

The patient should capture an HD image in an available camera which acts as the data the model predicts with.

Identify strong TR & EM

4. EMOTIONS: BEFORE / AFTER EM

Before the treatment , the user would feel desperate and in need of help. The disease might also cause them despair.

After using our model, They would feel hopeful and knowledgeable about what should be done to cure it.

4.REQUIREMENTS ANALYSIS

4.1 Functional requirements:

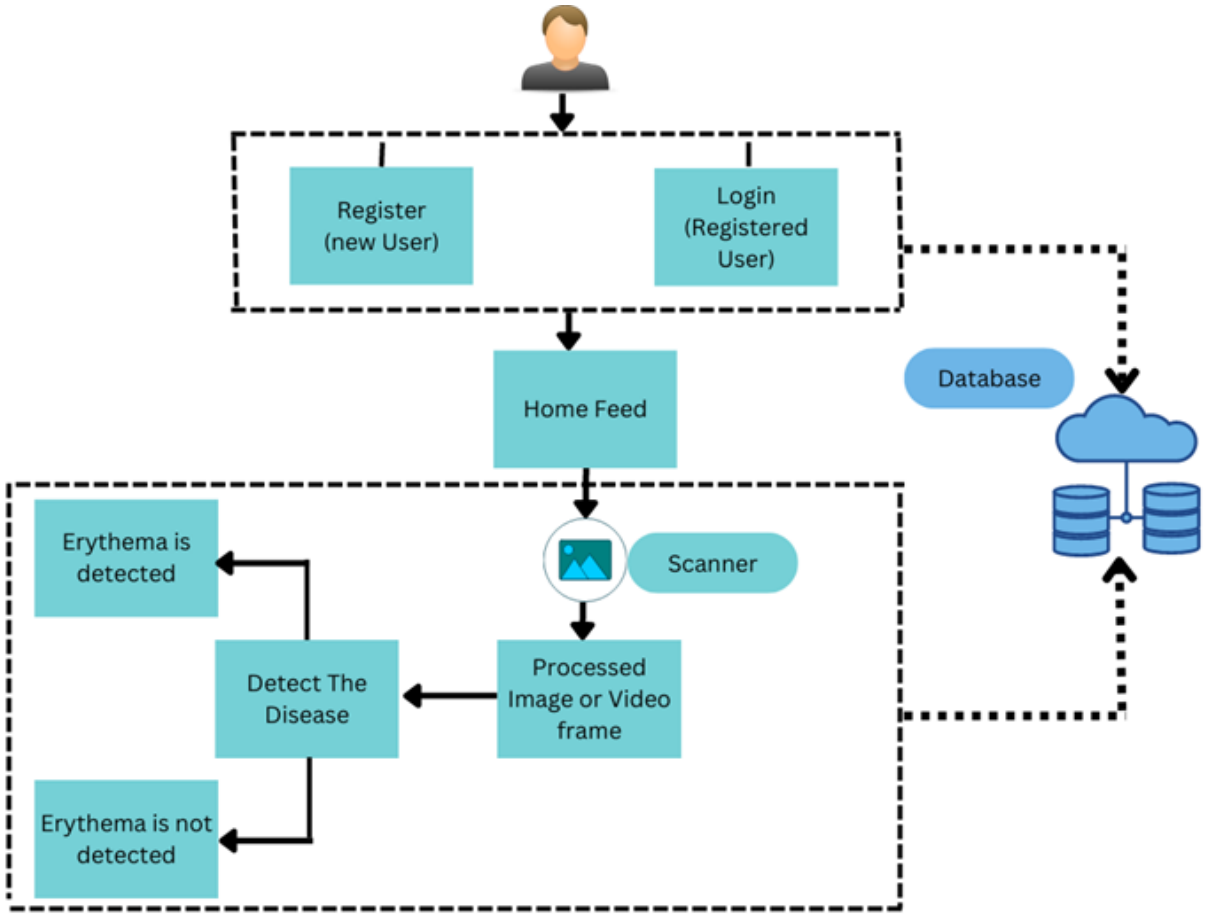
FR No.	Functional Requirement (Epic)	Sub Requirement (Story/ Sub-Task)
FR-1	User Registration	Registration through mail Registration throughMobile Number
FR-2	User Confirmation	Confirmation viaEmail Confirmation via OTP
FR-3	User Verification	Verification through CAPTCHA Verification throughI'm not a robot.
FR-4	User Authentication	Recognition of correct personResending the codein case of forgot password.
FR-5	User skin detection	scanning user's skin using YOLO and and a proper scanner and finding the kind of erythema the patient is affected by.
FR-6	User Submission	submitting the user details and scanned skin to the website to detect and provide the concerned solution.

4.2 Non-Functional Requirements:

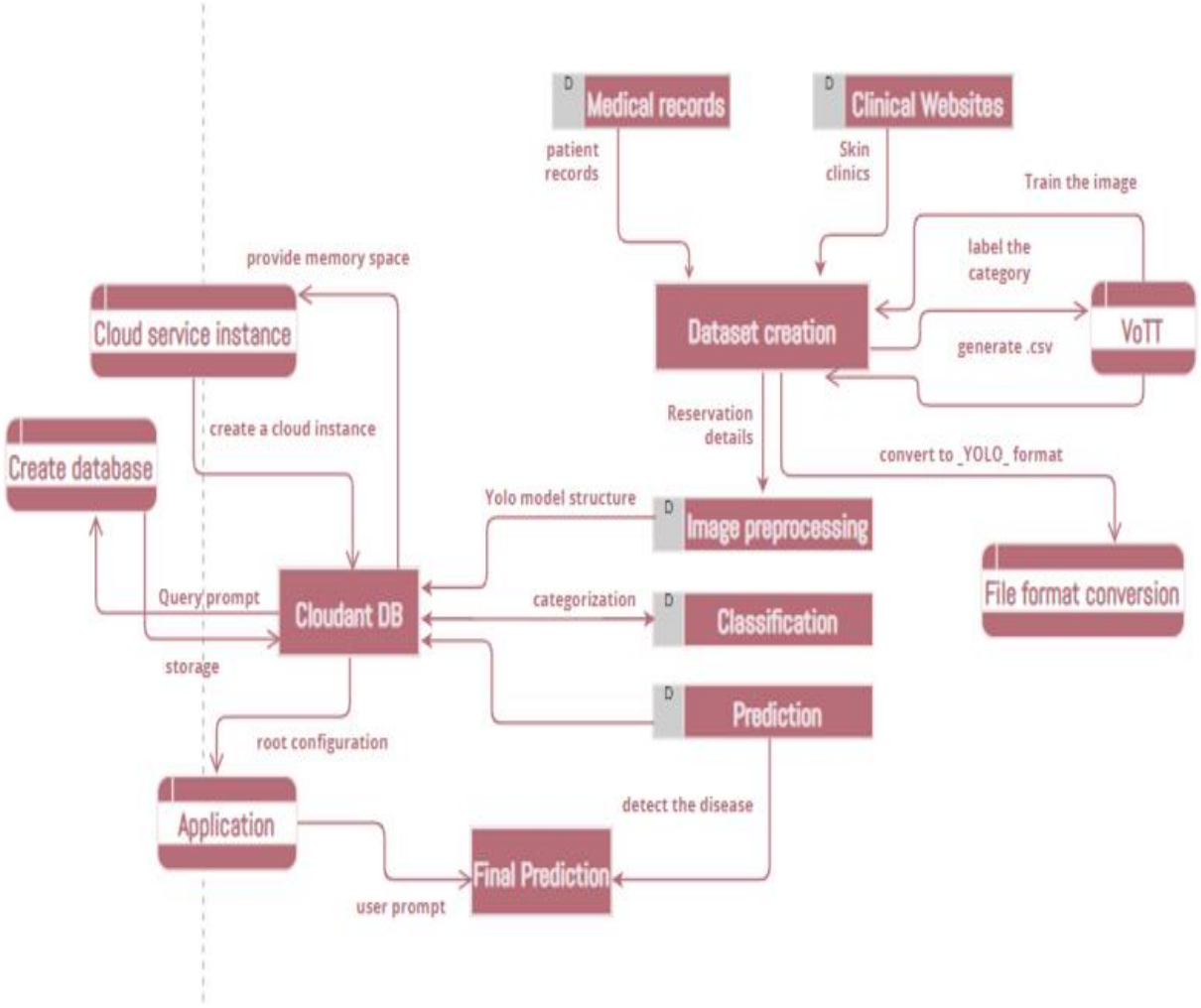
FR No.	Non-FunctionalRequirement	Description
NFR-1	**Usability**	YOLO algorithm (You Only Look Once) is used to detect the user affected skin region -wise and precisely predict the kind of erythema the user is suffering from.
NFR-2	**Security**	When we deal with medical grounds, we should provide more security services. There shouldn't be any errors, lagging , base of data of a patient profile, while working on the website.
NFR-3	**Reliability**	Reliability is said to be the measure of stability orconsistency of skin results shown in the website. performanceone in the field of accuracy.
NFR-4	**Performance**	The performance should be fast relaying. This prediction systemshould be madeavailable in cloud as well for more efficiency.
NFR-5	**Availability**	The Availability of getting used to this website is through by accessing IBM cognos Analytics andIBM cloud.

5.PROJECT DESIGN

5.1 Data flow diagrams:



5.2 Solution and Technical Architecture:



5.3 User Stories:

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	

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
		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
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low
		USN-4	As a user, I can register for the application through Gmail		Medium
	Login	USN-5	As a user, I can log into the application by entering email & password		High
	Dashboard	USN-5	As a user, I can Access my Dashboard		Medium
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
Customer Care Executive	Solution	USN-5	Responding to each email you can receive	Offer a solution for how your company can improve the customer's experience	High
Administrator	Manage	USN-5	Do-it-yourself service for delivering everything	Set of predefined requirements that must be met to mark a user story complete.	High

6.PROJECT PLANNING AND SCHEDULING

6.1 Sprint Planning and Estimation:

Sprints are the backbone of any good Agile development team. And the better prepared you are before a sprint, the more likely you are to hit your goals. Spring planning helps to refocus attention, minimize surprises, and guarantee better code gets shippied. Sprint planning aligns the development team with the product owner. You and your team requires communication and

clarity and make sure that your expectations are understood and can be done by your team is key to keeping everyone motivated and productive.

Step 1: Review your product roadmap

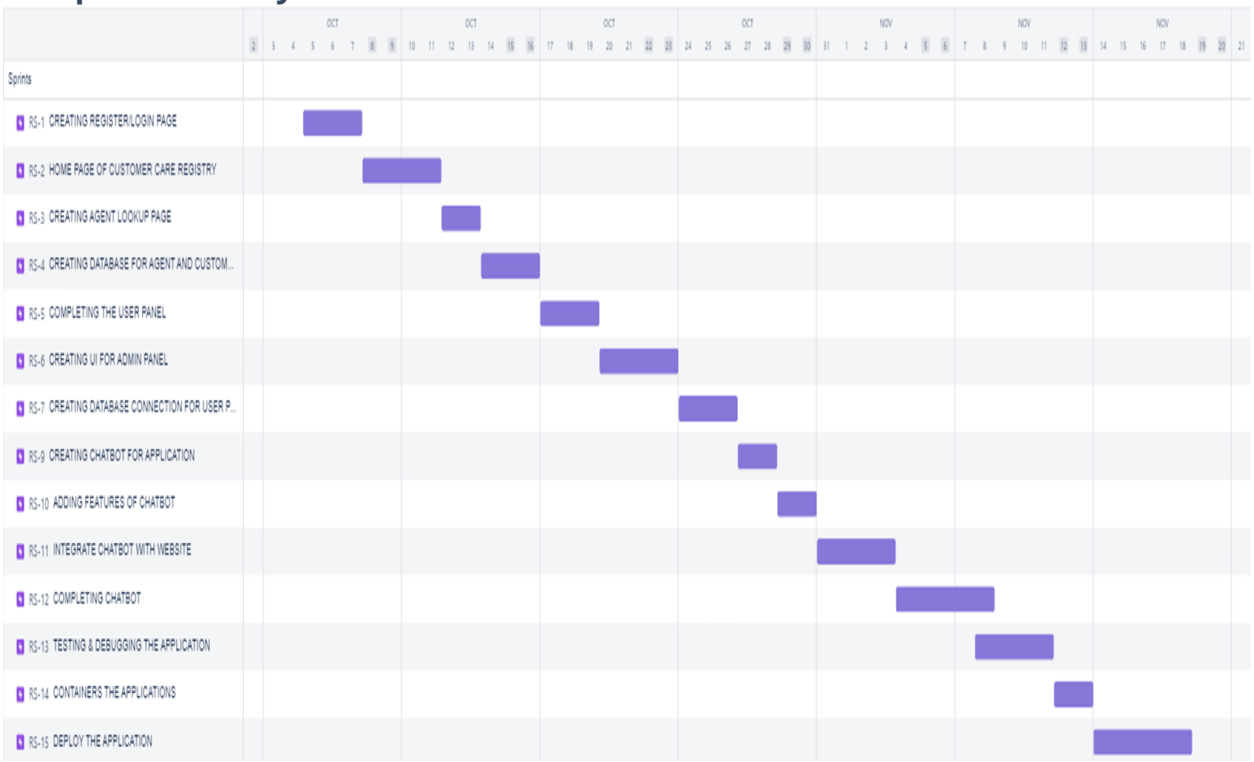
Step 2: Groom your product backlog and update user stories

Step 3: Propose a sprint goal and backlog before the sprint planning meeting

Step 4: Use data and experience to supercharge your Sprint planning meeting

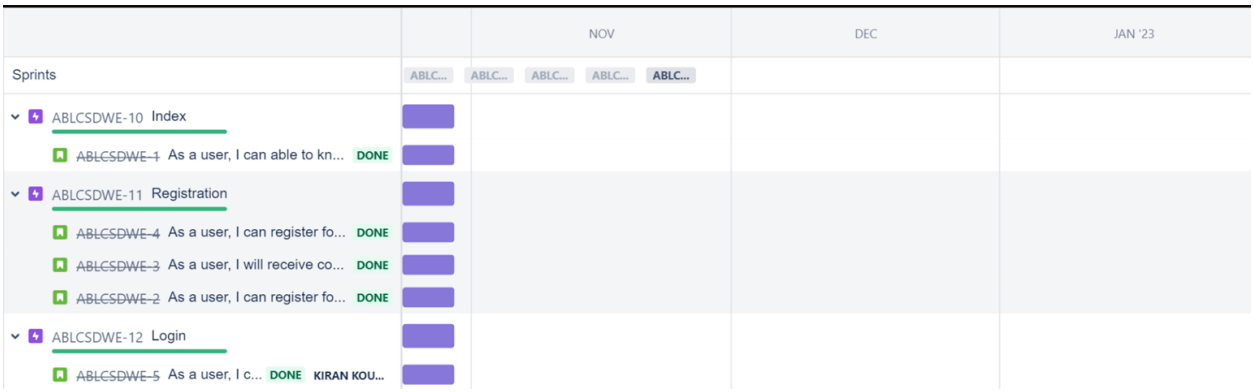
Step 5: Walk through each user story and describe what tasks need to be done

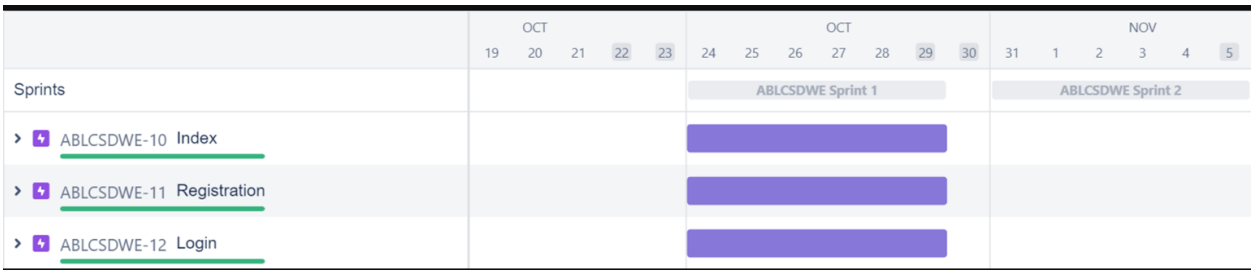
6.2 Sprint Delivery Schedule:



6.3 Reports from JIRA:

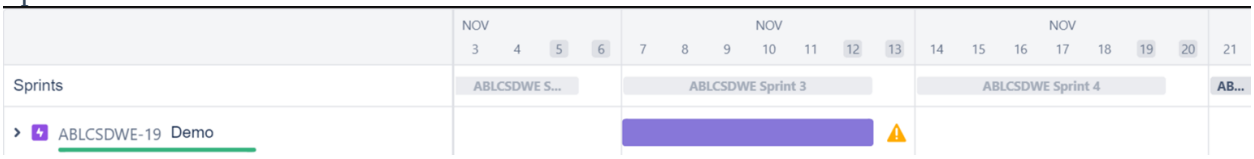
Sprint 1:





Sprint 2:

Sprint 3:



Sprint 4:

7. CODING & SOLUTIONING

7.1 Microsoft's Visual Object Tagging Tool (VoTT):

It is an open source annotation and labeling tool for image and video assets.

VoTT is a React + Redux Web application, written in TypeScript.

Features include:

- The ability to label images or video frames
- Extensible model for importing data from local or cloud storage providers
- Extensible model for exporting labeled data to local or cloud storage providers

Using VoTT:

- Creating Connections
- Creating a New Project
    - Project Settings
    - Security Tokens
- Labeling an Image
- Labeling a Video
- Exporting Labels

7.2 YOLO Project Structure:

It was proposed by Joseph Redmond et al. in 2015. It was proposed to deal with the problems faced by the object recognition models at that time, Fast R-CNN is one of the state-of-the-art models at that time but it has its own challenges such as this network cannot be used in real-time, because it takes 2-3 seconds to predicts an image and therefore cannot be used in real-time. Whereas, in YOLO we have to look only once in the network i.e. only one forward pass is required through the network to make the final predictions.

Code:

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

```
from Convert_Format import convert_vott_csv_to_yolo


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


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


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()
```

7.3 Database Schema:

A database schema defines how data is organized within a relational database; this is inclusive of logical constraints such as, table names, fields, data types, and the relationships between these entities. Schemas commonly use visual representations to communicate the architecture of the database, becoming the foundation for an organization's data management discipline.
A database schema is considered the "blueprint" of a database which describes how the data may relate to other tables or other data models. However, the schema does not actually contain data. key benefits of database schemas include:

- **Access and security**: Database schema design helps organize data into separate entities, making it easier to share a single schema within another database.
- **Organization and communication:** Documentation of database schemas allow for more organization and better communication among internal stakeholders.
- **Integrity**: This organization and communication also helps to ensure data validity.

Code:

```
from cloundant.client import cloudant

client=Cloudant.iam('username','apikey','connect True')

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

8. TESTING

8.1 User Acceptance Testing:

User acceptance testing, a testing methodology where the clients/end users involved in testing the product to validate the product against their requirements. It is performed at client location at developer's site.

For industry such as medicine or aviation industry, contract and regulatory compliance testing and operational acceptance testing is also carried out as part of user acceptance testing.

UAT is context dependent and the UAT plans are prepared based on the requirements and NOT mandatory to execute all kinds of user acceptance tests and even coordinated and contributed by testing team.

Acceptance criteria are defined on:

- Functional Correctness and Completeness
- Data Integrity
- Data Conversion
- Usability
- Performance
- Timeliness

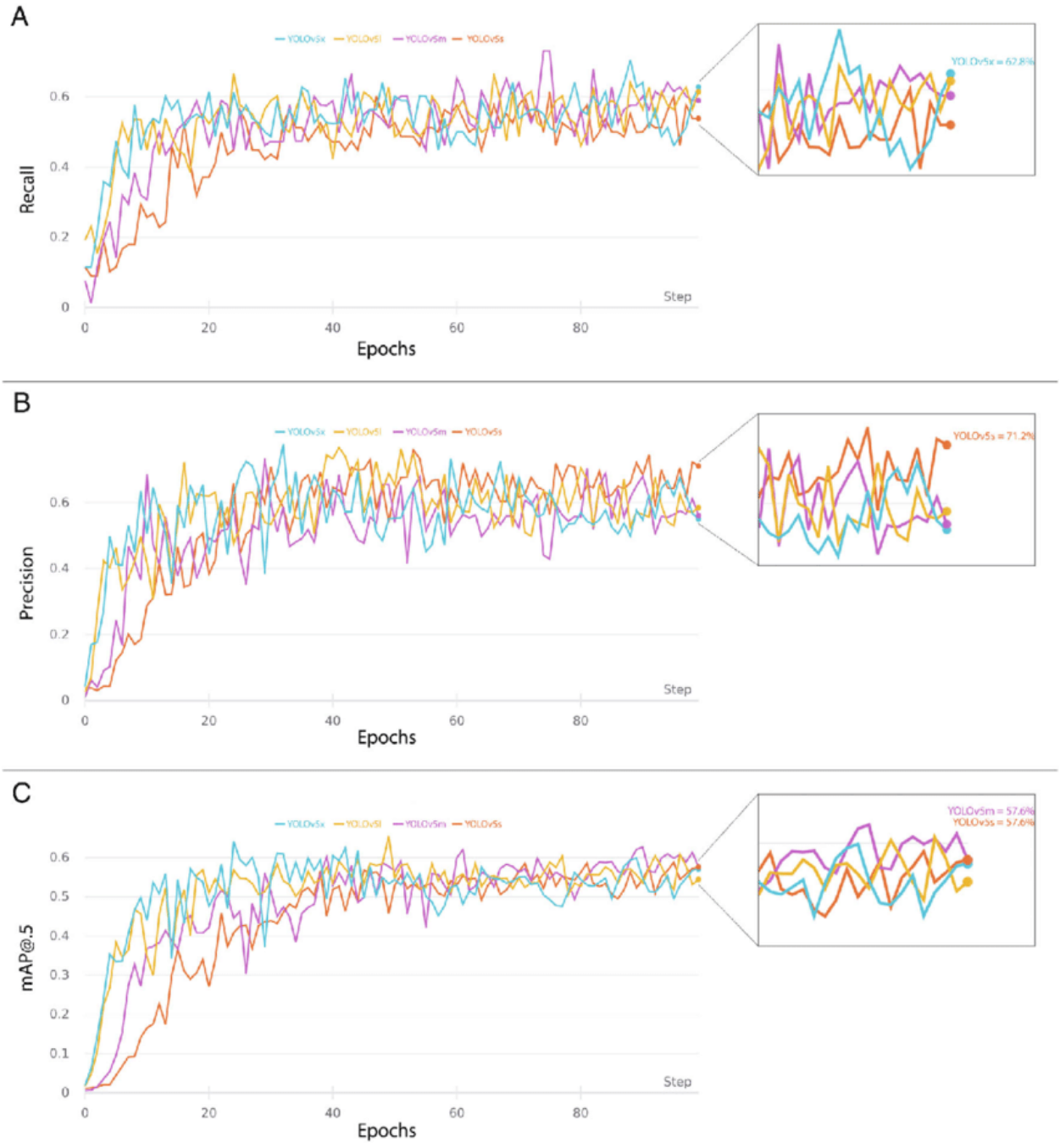
- Confidentiality and Availability
- Installability and Upgradability
- Scalability
- Documentation

9. RESULTS

9.1 Performance Metrics:

the performance metrics used for evaluating a classification model:

- Accuracy - The overall accuracy of a model is simply the number of correct predictions divided by the total number of predictions.
- Precision and Recall - Precision measures how good the model is at correctly identifying the positive class. Recall tell us how good the model is at correctly predicting all the positive observations in the dataset.
- F1-score - The F1 score is the harmonic mean of precision and recall. The F1 score will give a number between 0 and 1.
- AUC-ROC - The AUC is the measurement of the entire two-dimensional area under the curve and The ROC (Receiver Operating Characteristics) curve is a plot of the performance of the model



10. ADVANTAGES & DISADVANTAGES

Merits:

- In dermatology, although skin disease is a common disease, one in which early detection and classification is crucial for the successful treatment and recovery of patients, dermatologists perform most noninvasive screening tests only with the naked eye.
- This may result in avoidable diagnostic inaccuracies as a result of human error, as the detection of the disease can be easily overlooked.
- Therefore, it would be beneficial to exploit the strengths of CAD using artificial intelligence techniques, in order to improve the accuracy of dermatology diagnosis.

Demerits:

- An inherent disadvantage of clustering a skin disease is its lack of robustness against noise.
- Centroid that can generalize a cluster of data can significantly degrade the performance of these algorithms.
- the degradation problem that occurs when CNN models become too large and complex.
- Hence,We implement skip-connections in both segmentation and classification models.

11. CONCLUSION

The Project AI-Based Localization of Skin Disease With Erythema is used to find whether the person is having erythema or not. And our project helps lots of people to find whether their skin disease is erythema or not. Our website shows the accurate result so it helps the user to check their skin Disease. It is User Friendly Website.

12. FUTURE SCOPE

Future Scope of Our Project AI - Based Localization Of Skin Disease With Erythema is to try new algorthims and improve the accuracy of the result. And also developing a mobile application is our scope of the project

13. APPENDIX

Source Code:

Convert_csv_to_YOLO.py:

```
import os
import re
from os import makedirs, path

import numpy as np
import pandas as pd
from PIL import Image

from Get_File_Paths import ChangeToOtherMachine, GetFileList



def convert_vott_csv_to_yolo(
    vott_df,
    labeldict=dict(zip(["Cat_Face"], [0,])),
    path="",
    target_name="data_train.txt",
    abs_path=False,
):
```

```
# Encode labels according to labeldict if code's don't exist
if not "code" in vott_df.columns:
    vott_df["code"] = vott_df["label"].apply(lambda x: labeldict[x])
# Round float to ints
for col in vott_df[["xmin", "ymin", "xmax", "ymax"]]:
    vott_df[col] = (vott_df[col]).apply(lambda x: round(x))

# Create Yolo Text file
last_image = ""
txt_file = ""

for index, row in vott_df.iterrows():
    if not last_image == row["image"]:
        if abs_path:
            txt_file += "\n" + row["image_path"] + " "
        else:
            txt_file += "\n" + os.path.join(path, row["image"]) + " "
        txt_file += ",".join(
            [
                str(x)
                for x in (row[["xmin", "ymin", "xmax", "ymax", "code"]].tolist())
            ]
        )
    else:
        txt_file += " "
        txt_file += ",".join(
            [
                str(x)
```

```
                for x in (row[["xmin", "ymin", "xmax", "ymax", "code"]].tolist())
            ]
        )
        last_image = row["image"]
    file = open(target_name, "w")
    file.write(txt_file[1:])
    file.close()
    return True


def csv_from_xml(directory, path_name=""):
    # First get all images and xml files from path and its subfolders
    image_paths = GetFileList(directory, ".jpg")
    xml_paths = GetFileList(directory, ".xml")
    result_df = pd.DataFrame()
    if not len(image_paths) == len(xml_paths):
        print("number of annotations doesnt match number of images")
        return False
    for image in image_paths:
        target_filename = os.path.join(path_name, image) if path_name else image
        source_filename = os.path.join(directory, image)
        y_size, x_size, _ = np.array(Image.open(source_filename)).shape
        source_xml = image.replace(".jpg", ".xml")
        txt = open(source_xml, "r").read()
        y_vals = re.findall(r"(?:x>\n)(.*)(?:\n</)", txt)
        ymin_vals = y_vals[::2]
        ymax_vals = y_vals[1::2]
        x_vals = re.findall(r"(?:y>\n)(.*)(?:\n</)", txt)
```

```
        xmin_vals = x_vals[::2]
        xmax_vals = x_vals[1::2]
        label_vals = re.findall(r"(?:label>\n)(.*)(?:\n</)", txt)
        label_name_vals = re.findall(r"(?:labelname>\n)(.*)(?:\n</)", txt)
        df = pd.DataFrame()
        df["xmin"] = xmin_vals
        df["xmin"] = df["xmin"].astype(float) * x_size
        df["ymin"] = ymin_vals
        df["ymin"] = df["ymin"].astype(float) * y_size
        df["xmax"] = xmax_vals
        df["xmax"] = df["xmax"].astype(float) * x_size
        df["ymax"] = ymax_vals
        df["ymax"] = df["ymax"].astype(float) * y_size
        df["label"] = label_name_vals
        df["code"] = label_vals
        df["image_path"] = target_filename
        df["image"] = os.path.basename(target_filename)
        result_df = result_df.append(df)
    #     Bring image column first
    cols = list(df.columns)
    cols = [cols[-1]] + cols[:-1]
    result_df = result_df[cols]
    return result_df


def crop_and_save(
    image_df,
    target_path,
```

```
    target_file,
    one=True,
    label_dict={0: "house"},
    postfix="cropped",
):
    """Takes a vott_csv file with image names, labels and crop_boxes
    and crops the images accordingly

    Input csv file format:

    image   xmin ymin xmax ymax label
    im.jpg  0    10   100  500  house



    Parameters
    ----------
    df : pd.Dataframe
        The input dataframe with file_names, bounding box info
        and label
    source_path : str
        Path of source images
    target_path : str, optional
        Path to save cropped images
    one : boolean, optional
        if True, only the most central house will be returned

    Returns
    -------
```

```
True if completed succesfully
"""
if not path.isdir(target_path):
    makedirs(target_path)


previous_name = ""
counter = 0
image_df.dropna(inplace=True)
image_df["image_path"] = ChangeToOtherMachine(image_df["image_path"].values)


def find_rel_position(row):
    current_name = row["image_path"]
    x_size, _ = Image.open(current_name).size
    x_centrality = abs((row["xmin"] + row["xmax"]) / 2 / x_size - 0.5)
    return x_centrality


if one:
    centrality = []
    for index, row in image_df.iterrows():
        centrality.append(find_rel_position(row))
    image_df["x_centrality"] = pd.Series(centrality)
    image_df.sort_values(["image", "x_centrality"], inplace=True)
    image_df.drop_duplicates(subset="image", keep="first", inplace=True)
new_paths = []
for index, row in image_df.iterrows():
    current_name = row["image_path"]
    if current_name == previous_name:
        counter += 1
```

```
        else:
            counter = 0
        imageObject = Image.open(current_name)
        cropped = imageObject.crop((row["xmin"], row["ymin"], row["xmax"], row["ymax"]))
        label = row["label"]
        if type(label) == int:
            label = label_dict[label]
        image_name_cropped = (
            "_".join([row["image"][:-4], postfix, label, str(counter)]) + ".jpg"
        )
        new_path = os.path.join(target_path, image_name_cropped)
        cropped.save(new_path)
        new_paths.append(new_path.replace("\\", "/"))
        previous_name = current_name
    pd.DataFrame(new_paths, columns=["image_path"]).to_csv(target_file)
    return True


if __name__ == "__main__":
    # Prepare the houses dataset for YOLO
    labeldict = dict(zip(["house"], [0,]))

    multi_df =  r"C:\Users\Admin\Desktop\yolo_structure\Data\Source_Images\Training_Images\vott-csv-
      export\Annotations-export.csv"

    convert_vott_csv_to_yolo(
        multi_df,
        labeldict,
```

```
        path=r"C:\Users\Admin\Desktop\data\skin",
        target_name= "data_train.txt"
    )

    # Prepare the windows dataset for YOLO
    path = r"C:\Users\Admin\Desktop\yolo_structure\Data\Source_Images\base"
    csv_from_xml(path,
      r"C:\Users\Admin\Desktop\data\windows").to_csv(r"C:\Users\Admin\Desktop\yolo_structure\Data\S
      ource_Images\base/annotations.csv")

    label_names = [
        "Erythema multiforme (EM)",
        "Erythema chronicum migrans",
        "Erythema migrans",
        "Erythema marginatum",
        "Erythema infectiosum",
        "Erythema nodosum"
    ]
    labeldict = dict(zip(label_names, list(range(6))))
    convert_vott_csv_to_yolo(
        csv_from_xml(path, r"C:\Users\Admin\Desktop\data\windows"), labeldict
    )
```

Train YOLOv3 Detector:

```
import os
import sys


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 = os.path.join(get_parent_dir(1), "2_Training", "src")
utils_path = os.path.join(get_parent_dir(1), "Utils")

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), "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

if __name__ == "__main__":
    # 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

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

# 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()
```

GitHub:

gh repo clone IBM-EPBL/IBM-Project-5510-1658769141

Project Demo Link:

https://drive.google.com/file/d/1-D08VKkBEN4U0HSD3wD0j406GURgmOEV/view?usp=sharing