

AI-Based Localization And Classification Of Skin Disease With Erythema

TEAM ID: PNT2022TMID53159

TEAM MEMBERS:

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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. Skin diseases can be prevented by investigating the infected region at an early stage. The characteristic of the skin images is diversified so that it is a challenging job to devise an efficient and robust algorithm for automatic detection of skin disease and its severity. Skin tone and skin color play an important role in skin disease detection. Color and coarseness of skin are visually different. Automatic processing of such images for skin analysis requires quantitative discriminator to differentiate the diseases.

1.2 Purpose:

To overcome the above problem we are building a model which is used for the prevention and early detection of skin cancer, psoriasis. Basically, skin disease diagnosis depends on the different characteristics like 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 analyzes the image and detects whether the person is having skin disease or not.

2.Literature Survey:

1. Traditional Techniques for Skin Disease Image Classification:

Authors : Tanvi Goswami; Vipul K. Dabhi; Harshadkumar B. Prajapati. Year:2018

They developed an expert system limited to three disease classifications. The system consists of two independent units. Data processing and image processing unit. The data processing unit was responsible for image acquisition, preprocessing for noise removal, segmentation, and feature extraction from skin disease images, while the data processing unit was used for data mining tasks or classification. They proposed a hybrid model to diagnose benign or malignant skin lesions using multi-objective optimization algorithms NSGA-II and ANN. Classify skin lesions using a bag-of-features approach and generate using SIFT. The SIFT algorithm identifies and locates key points from the input image and generates a feature vector. These features are fed into a hybrid classifier, which trains an ANN using NSGA-II. The author also used ANN-PSO (his ANN trained with particle swarm optimization) and his ANN-CS to compare the accuracy of the models.

2.Effective diagnosis mechanism for skin disorders using image mining

techniques *Authors: Galiveeti Poornima, Dr. Deepak S Sakkari Year:2022* The first stage of the model requires dataset compilation and data enrichment. The dataset was created entirely by collecting photographs from different locations with different diseases. The original data set consisted of 30 images and was expanded to 150 images. The second stage of the model uses various image processing techniques to extract features from images of skin disease. The third stage of the model classifies the skin disease images.

3. Deep learning based approach for Skin Disease Image Classification

Authors: Zhang, Sun et al, Gessert . Year:2020 They used a three-way disease distribution algorithm designed to classify specific skin lesions as malignant, benign, or non-neoplastic. In addition, 9-way disease classification was performed to classify a given lesion into one of the 9 aforementioned categories. A state-of-the-art CNN architecture, InceptionV3, was used for skin lesion classification, and it was concluded that when trained on sufficient data, the CNN could outperform human experts. They proposed handcrafted feature-based and CNN-based approaches for classifying clinical images. They trained CNN architects. Caffenet, Fine-tuned Caffenet, VGG, Fine-tuned VGG Net. They proposed a CNN architecture by specifying 16 different filters with a kernel size of 7x7 with pooling layers for downsampling. That is, the

proposed model was trained for malignant and benign disease categories. melanoma, seborrheic keratosis and nevus

4.Skin Disease Detection And Classification *Authors: V. Pugazhenthi, Sagar K. Naik, Amruta D. Joshi, Shreya S. Manerkar, Vinita U. Nagvekar, Kalpita P. Naik, Chinmay G. Palekar, K Sagar Year:2019* GLCM (Grey Level Co-occurrence Matrix) This method analyzes the texture of the image. image quality evaluation. The image quality evaluation functions MSE (Mean Square Error) and PSNR (Peak Signal to Noise Ratio) are extracted from the segmented images. Full reference method This metric is the mean squared error (MSE) calculated by averaging the squares of the intensity differences of the pixels in the distortion and reference image pixels, together with the associated signal to-noise ratio (PSNR) magnitude. will be Classification is the process of identifying which category the input data belongs to. Decision tree, ID3 algorithm is the classification method used here.

5.Skin Disease prediction *Authors: Mr. T.K.Jagtap,Mr. H.P.Shinde,Mr. O.V.Gaware,Mr. S.R.Maurya Year:2021* Their implementation is mobile-based, it is highly accessible even in remote areas and completely non-invasive to the patient's skin. Image processing techniques are performed on the image and the detected diseases are displayed at the exit. Convolutional Neural Networks (CNN/Conv Nets) are a class of deep neural networks most commonly used for analyzing visual images. TensorFlow is a symbolic math library that uses data flow and differentiable programming to perform a variety of tasks focused on training and inferring deep neural networks. Deep learning algorithms take longer to train because they use very large datasets. Deep learning algorithms, unlike machine learning, choose their own features. This makes the prediction process easier for the end user, as less preprocessing is required.

6.Skin Lesion Segmentation Based on Deep Learning *Authors: Cheng Huang, Yongbin Yu Year:2020* The authors implemented deep learning, Mask R-CNN to segment skin diseases, and introduced K-means clustering algorithm for preprocessing the dataset. Experimental results are based on the ISIC (International Skin Imaging Collaboration) dataset. Anticipate the presence of blurry borders and complex textures. There are many skin disease segmentation algorithms based on deep learning such as convolutional neural networks (CNN) and many derivatives based on convolutional neural networks such as superpixel segmentation and U- Net segmentation algorithms. If you use Faster R-CNN to treat skin diseases, you will get a new idea of using R-CNN series neural networks to treat skin diseases. In deep learning, the R-CNN series of neural network models perform well in region detection and determination. Among them, the instance segmentation effect of Mask R- CNN is attractive.

7. Skin Disease Classification System Based on Machine Learning

Technique *Authors: Saja Salim mohammed ,Jamal Mustafa Al-Tuwaijari Year:2020* They used machine learning and deep learning algorithms to implement data extraction techniques from medical systems to help design automated disease diagnostic tools. The authors used

several types of artificial intelligence algorithms to train the classifiers needed to perform machine diagnostics using machine learning and deep learning principles. The close relationship between artificial intelligence, machine learning and deep learning is also an ongoing progressive process.

8. A Smartphone-Based Skin Disease Classification Using MobileNet CNN

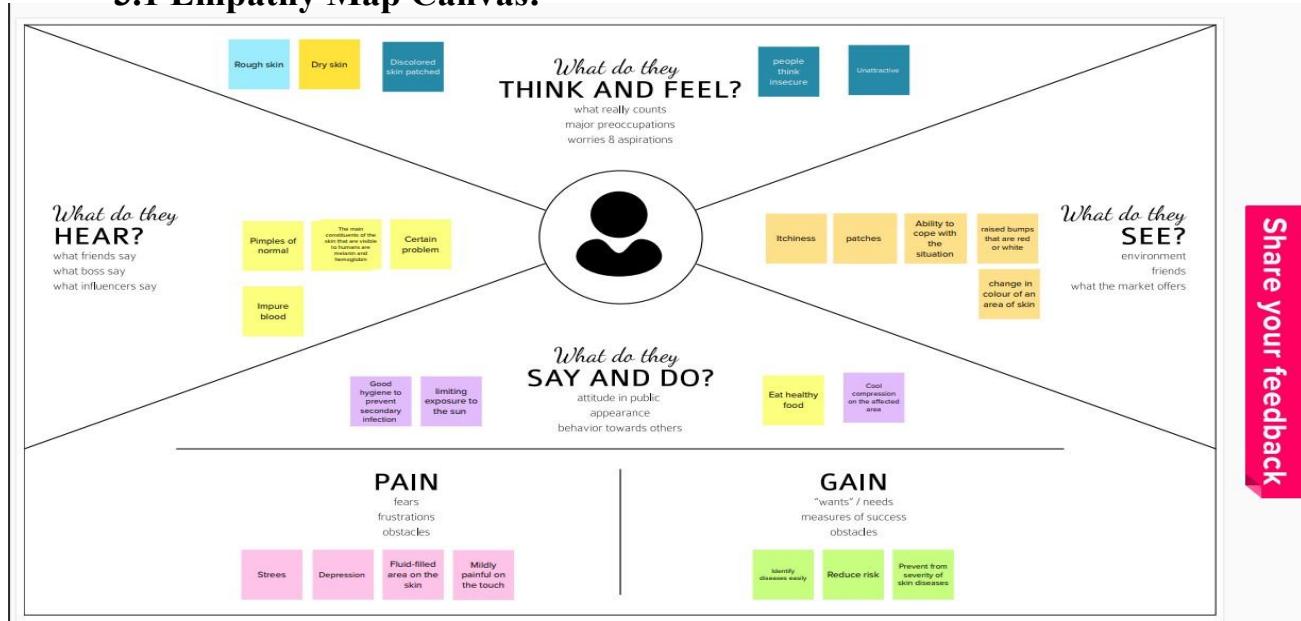
Authors: Jessica Velasco, Cherry Pascion, Jean Wilmar Alberio Year:2019 The authors aim to develop a skin disease classifier application on Android phones that classifies various skin diseases using pre-trained convolutional neural network models that perform best in this area of the dataset. Images collected from public online dermatology repositories have been validated by dermatologists. The proponent chose a pre-trained CNN MobileNet model. To properly deploy the CNN model in your Android application, you need to convert the .h5 file to a protobuff file.

9. AI recognition in skin pathologies detection *Authors: Dmitriy Gavrilov, Lyubov Lazarenko, Emil Zakirov Year:2020* Cutaneous malignancies begin in the epidermis, or top layer of skin. There are three main types of cells in this layer: squamous cells, basal cells, and melanocytes. For early detection of skin cancer, it is usually recommended to focus on ABCDE criteria, including features such as asymmetry, uneven borders, odd and irregular colors, diameter greater than 6 mm, and timely assessment. Other features can also be used to distinguish between malignant and benign tumors from pathological images. Using computer vision to detect skin diseases is not a completely new concept. For tasks such as object recognition and natural image classification, convolutional neural networks (CNNs) outperform alternative approaches. Known CNN architectures are often trained on huge image datasets to achieve high accuracy.

10. A Survey Skin Disease Classification from Image *Authors: Tanvi Goswami, Vipul K. Dabhi, Harshadkumar B. Prajapati Year:2020* Diagnosing skin diseases from imaging is a challenging task due to the wide variety of skin diseases. the following questions have been raised by researchers when classifying skin diseases: different types of lesions can occur in the disease. dermatologists can have difficulty diagnosing diseases by visual examination because many diseases share similar visual features such as skin tone , skin type, age etc. which complicates computer-aided diagnosis. Therefore, in computer-aided diagnosis, it is important to select features relevant to such diseases in order to properly identify them. The effectiveness of an automated system depends on how well it handles the required image processing and machine learning tasks. Recent technological advances are generating massive amounts of medical data every day, which contain important and valuable information about patients. Image-based artificial intelligence is gaining popularity for treating some ailments, especially skin diseases.

3. IDEATION & PROPOSED SOLUTION:

3.1 Empathy Map Canvas:



3.2 Ideation & Brainstorming:

The screenshot shows a digital template for a brainstorming session. The left sidebar has a blue header "Template" and a circular icon with a lightbulb.

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
👤 3-8 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

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

Key rules of brainstorming

To run a smooth and productive session:

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

How might we detect the skin disease erythema

Share template feedback

2 Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

TIP
You can stick a sticky note and set the pen to pencil to quickly switch between modes.

3 Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.

20 minutes

SYMPOMS **CAUSES** **MEDICINES** **AFFECTS**

4 Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes

After you collaborate

You can export the mural as an image or pdf to share with members of your company who might find it helpful.

Quick add-ons

- Share the mural**
Share a link to the mural with stakeholders to keep them in the loop about the outcome of the session.
- Export the mural**
Export a copy of the mural as a PNG or PDF to reflect decisions, include in slides, or reuse in your office.

Keep moving forward

- Strategy blueprint**
Define the components of a new idea or strategy.
[Open the template](#)
- Customer experience journey map**
Understand customer needs, motivations, and obstacles for an experience.
[Open the template](#)
- Strengths, weaknesses, opportunities & threats**
Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan.
[Open the template](#)

Share template feedback

3.3 PROPOSED SOLUTION:

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	In both industrialized and developing nations, skin conditions rank among the most prevalent illnesses. People with skin conditions have stressful lives because the conditions have a variety of negative effects on their self-esteem and confidence.
2.	Idea / Solution description	The dermatologist benefits from the YOLO object detector. In order to make quick decisions about skin diseases, medical imaging is crucial. Medical imaging is used to identify and treat disease as well as to reveal internal structures that are covered by the skin.
3.	Novelty / Uniqueness	The work's novelty is that the system automatically assists the dermatologist by identifying the disease from images or videos when the patient needs immediate attention during treatment.
4.	Social Impact / Customer Satisfaction	Make the patient more assure about their safety. We now have a classification model that can classify multiple diseases in a single image and is more accurate than a baseline model trained without segmentation. The field of dermatology may be able to use CAD with this improved performance.
5.	Business Model (Revenue Model)	This detector can provide accurate results; it's simple to use; patients can operate it independently; and it's inexpensive.
6.	Scalability of the Solution	This model guarantees the security and precision of skin disease detection results. There is no need for the patient or their family to worry about the duration of treatment or recovery.

3.4 Problem Solution Fit:

Team ID : PNT2022TMID53159

Project Design Phase-I - Solution Fit Template

Define CS, fit into CC	<p>1. CUSTOMER SEGMENT(S) Who is your customer? i.e. working parents of 0-5 y.o. kids All the patients including child, adult and old age people.</p>	<p>6. CUSTOMER CONSTRAINTS What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices. The cost and budget aspects constraints a patient to take necessary action.</p>	<p>5. AVAILABLE SOLUTIONS What solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking A portal or chat window (basically a computer program) can help in making a platform for conversation between patient and doctor to solve their concerns.</p>	AS
Focus on J&P, tap into BE, understand RC	<p>2. JOBS-TO-BE-DONE / PROBLEMS Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides. Delayed test reports or vague reports on the diagnosis can be considered as a problem.</p>	<p>9. PROBLEM ROOT CAUSE What is the real reason that this problem exists? What is the back story behind the need to do this job? i.e. customers have to do it because of the change in regulations. Even though a patient can consult a doctor in-person and gets analysis on his conditions, it generally takes quite a lot of time and physical work.</p>	<p>7. BEHAVIOUR What does your customer do to address the problem and get the job done? i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace) A chatbot which can interpret a lot of intents that are being provided by a patient and be able to prescribe medications based on the diagnosis. These chatbots have to be supporting 24 X 7 and should provide a quick response, irrespective of the number of patients ping the system.</p>	BE
Identify strong TR & EM	<p>3. TRIGGERS What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news. The ability to diagnose a disease real quick and get a quick response from the hospital.</p> <p>4. EMOTIONS: BEFORE / AFTER How do customers feel when they face a problem or a job and afterwards? i.e. lost, insecure > confident, in control - use it in your communication strategy & design. It makes a patient to fell depressed and worried before and it makes him/her to feel confident and hospitalized after.</p>	<p>10. YOUR SOLUTION If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality. If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour. Patients should be made aware of the solutions that are being provided to solve their issues.</p>	<p>8. CHANNELS OF BEHAVIOUR 8.1 ONLINE What kind of actions do customers take online? Extract online channels from #7 Quick approach to the online portals or chatbots.</p> <p>8.2 OFFLINE What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development. Try to reach the hospital and get clarified on their queries.</p>	CH

Explore AS, differentiate

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

Identify strong TR & EM

4. Requirement Analysis:

4.1 Functional Requirements: These are the requirements that the end user specifically demands as basic facilities that the system should offer. All these functionalities need to be necessarily incorporated into the system as a part of the contract. These are represented or stated in the form of input to be given to the system, the operation performed, and the output expected. They are basically the requirements stated by the user which one can see directly in the final product. Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration using phone, laptop, computer
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Profile	Users provides their medical history
FR-4	User Interface	User login form Admin login form
FR-5	User Uploads Images (Input)	Upload Images as jpeg Upload Images as png
FR-6	Output Analysis	Output analyzed through trained model

Advantages: It allows you to determine if the application has all the functionalities specified in the functional requirements. The most cost-effective time to correct errors is during the functional requirement gathering stage.

4.2 Non Functional Requirements

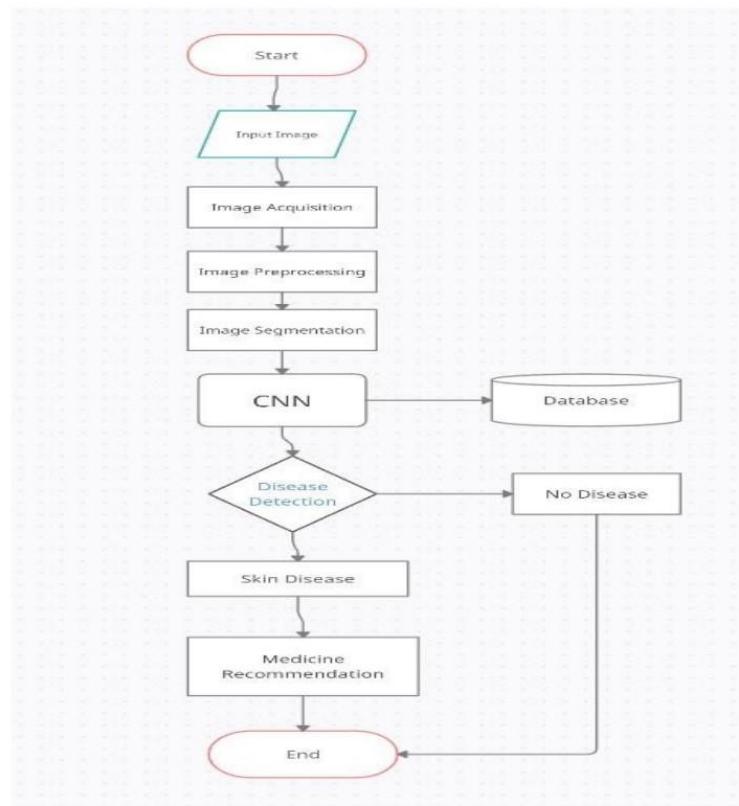
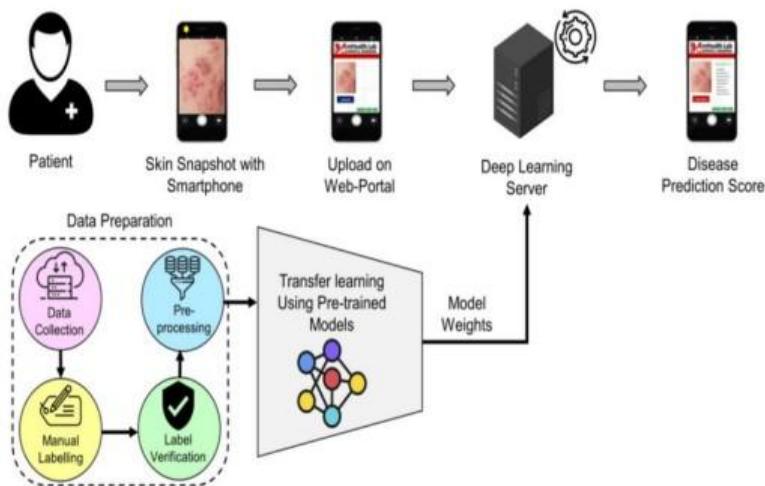
These are basically the quality constraints that the system must satisfy according to the project contract. The priority or extent to which these factors are implemented varies from one project to another. They are also called non-behavioral requirements. Following are the nonfunctional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	Used to classify skin disease with erythema
NFR-2	Security	<p>It ensures about patient safety during process</p> <p>It prevents unauthorized individuals from accessing user's data</p>
NFR-3	Reliability	<p>Even with more users, there will be a good performance without failure</p> <p>Less time consumption</p>
NFR-4	Performance	<p>With greater accuracy, the performance is high</p> <p>The trained model can predict an accurate result and took less time when compare to reality</p>
NFR-5	Availability	With a good system, all authorized users can access it

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.



User Stories

Use the below template to list all the user stories for the product.

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.		Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password		High	Sprint-1
	Dashboard	USN-5	As a user, I can Access my Dashboard.		Medium	Sprint-3
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-4
Customer Care Executive	Solution	USN-5	Responding to each email you receive can make a lasting impression on customers.	Offer a solution for how your company can improve the customer's experience.	High	Sprint-3
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	Sprint-4

5.2.1 Technology Architecture:

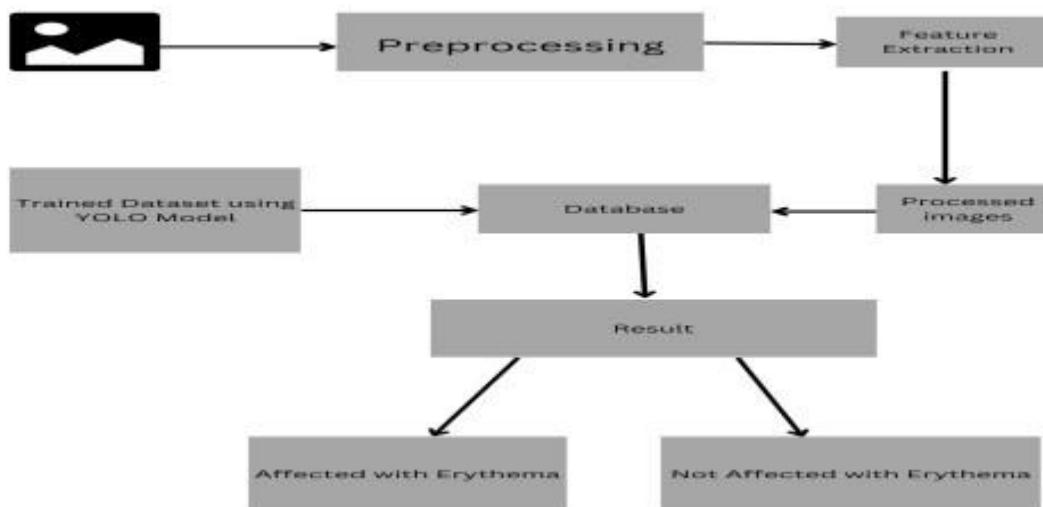


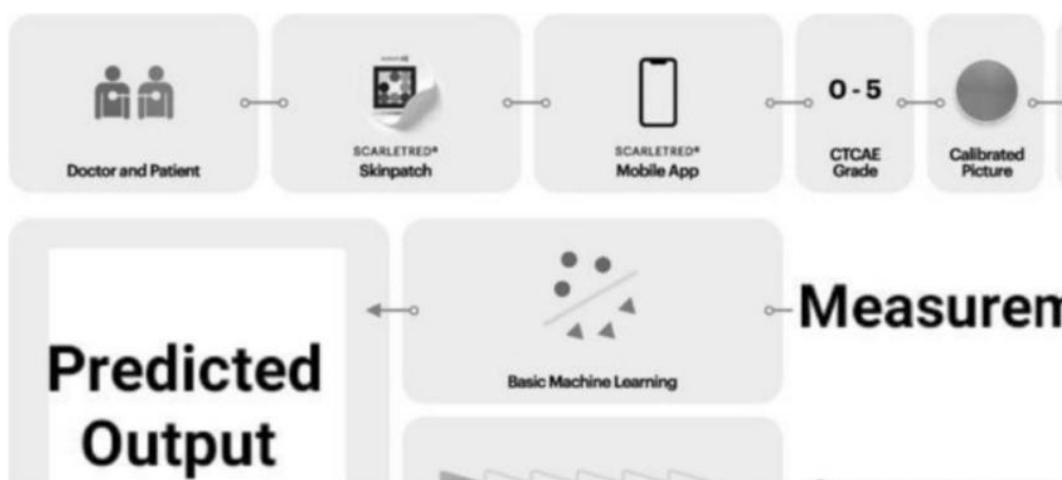
Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	How user interacts with application e.g. Web UI, Chatbot etc.	HTML, CSS, JavaScript .
2.	Application Logic-1	Logic for a process in the application	Python
3.	Application Logic-2	Logic for a process in the application	IBM Watson Assistant
4.	Cloud Database	Database Service on Cloud	IBM Cloudant
5.	Machine Learning Model	Purpose of Machine Learning Model	Object Recognition Model
6.	Infrastructure (Server / Cloud)	Application Deployment on Cloud Server Configuration :	Kubernetes

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	List the open-source frameworks used	Django
2.	Security Implementations	List all the security / access controls implemented, use of firewalls etc.	Encryptions
3.	Scalable Architecture	Justify the scalability of architecture (3 – tier, Micro-services)	3-Tier Architecture

5.2.2 Solution Architecture:



Significant advances in computer-aided diagnostics using artificial intelligence (AI). There is no practical method to analyze and classify radiation-induced skin reactions (RISR). The aim of this single-center study was to develop machine learning and deep learning approaches using deep convolutional neural networks (CNNs) for automatic classification of RISR. According to the Common Terminology Criteria for Adverse Events (CTCAE) rating system. Scarlet Vision, a novel and state-of-the-art digital skin imaging modality suitable for remote monitoring and objective assessment of acute RISR, was used to convert 2D digital skin images using the CIELAB color space and perform measurements. Various machine learning and deep convolutional neural network algorithms have been investigated for automatic classification of RISR. This study is the first to focus on radiation dermatitis erythema and use a machine learning model to provide benchmark results. The results of this study confirm that the proposed system can serve as a pre-screening and decision support tool for oncologists or patients, allowing rapid, reliable, and efficient assessment of erythema grading. increase.

5.3 User Stories:

AI BASED LOCALIZATION AND CLASSIFICATION OF SKIN DISEASE WITH ERYTHEMA					
Start	Entice	Enter	Engage	Exit	Extend
Browsing, booking, attending, and rating a local city tour	How does someone initially become aware of this process?	When do people experience as they begin the process?	In the core moments in the process, what happens?	What do people typically experience as the process finishes?	What happens after the experience is over?
Steps What does the person (or group) typically experience?	Symptoms Getting suspicious Searching for remedies	Information about you Screening Answer your questions	Upload your photo Ask Questions Get Information	Meet Leave Treatment	Downstage Out Shift
Interactions What interactions do they have at each step along the way?	How can I measure the effectiveness of my treatment?	Find the place to go Decide on the treatment	The customer checks his/her phone Provides feedback to the group	Setting up a regular checkup and follow-up They will come to know the type of skin disease The doctor will prescribe the treatment method	Case being sent to medical experts Consulting
Goals & motivations At each step, what is a person's primary goal or motivation? ("Help me..." or "Help me avoid...")	Want to feel better Want to stay healthy	Desire to be treated Breakthrough	Unconscious need or desire Spark desire to participate	Afterwards take care The doctor is satisfied with the results	To get a better solution
Positive moments What steps does a typical person experience in perspective? (i.e., moving on, gratifying, exciting?)	Receiving the best treatment Improving health	Receiving the best treatment Improving health	Encouraging positive responses from systems and others	The doctor is happy Everyone is healthy	Very satisfied Thoroughly satisfied
Negative moments What steps does a typical person experience in perspective? (i.e., frustrating, confusing, engaging, costly, or time-consuming?)	They still feel uncomfortable Every day they feel worse than the previous	Not too pleased with the service received Most people don't like the service	They feel stressed They feel like they are not doing well	They feel sick Everyone is sick	Very dissatisfied High-risk
Areas of opportunity How might we make each step better? What ideas do we have? What have others suggested?	Make treatment less Fast and efficient Less invasive and less painful	Improve the quality of treatment received Improve the quality of treatment received Less invasive and less painful	To tell all the types of skin diseases and its symptoms	What kind of a treatment is available in the market for skin diseases?	Developing medical tools

6. PROJECT PLANNING & SCHEDULING:

6.1 Sprint Planning & Estimation:

S.n o	Milestone	Activities	Start Date	End Date
1	Project Objectives	Prepare the project objectives.	22-Aug-2022	27-Aug-2022
2	Pre-Requisites	Ø Install Python IDE Ø Install Microsoft's Visual Object Tagging Tool Ø Download YOLO Project Structure	22-Aug-2022	27-Aug-2022
3	Create Dataset	Creating Dataset from scratch.	22-Aug-2022	27-Aug-2022
4	Annotate Images	Create a project in VOTT VOTT Project Creation.	22-Aug-2022	27-Aug-2022
5	Training YOLO	Download and Convert Pre-Trained weights. Train YOLOV3 Detector	24-oct-2022	19-Nov-2022
6	Cloudant DB	Ø Register and login to IBM cloud Ø Create service instance Ø Create service credentials. Ø Launch Cloudant DB, Create Database	24-oct-2022	19-Nov-2022

7	Application Building	<ul style="list-style-type: none"> Ø Build HTML page Ø Build PYTHON code Ø Run the application 	24-oct-2022	19-Nov-2022
8	Ideation Phase	<ul style="list-style-type: none"> Ø Literature Survey Ø Empathy Map Ø Ideation 	29-Aug-2022	17-Sept-2022
9	Project Design Phase - I	<ul style="list-style-type: none"> Ø Proposed Solution Ø Problem Solution Fit Ø Solution Architecture 	19-Sept-2022	01-Oct-2022
10	Project Design Phase - II	<ul style="list-style-type: none"> Ø Customer Journey Ø Functional Requirement Ø Data Flow Diagrams Ø Technology Architecture 	03-Oct-2022	15-Oct-2022
11	Project Planning Phase	<ul style="list-style-type: none"> Ø Prepare Milestone & Activity List Ø Sprint Delivery Plan 	17-Oct-2022	22-Oct-2022
12	Project Development Phase	<ul style="list-style-type: none"> Ø Project Development - Delivery of Sprint-1 Ø Project Development - Delivery of Sprint-2 Ø Project Development - Delivery of Sprint-3 	24-Oct-2022	19-Nov-2022

		Ø Project Development - Delivery of Sprint-4		
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6.2 Sprint Delivery Schedule:

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 confirming my password	8	High	Ayush & Samir
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	5	High	Aasif & Sushil
Sprint-1	Login	USN-3	As a user, I can log into the application by entering email & password	7	High	Samir & Sushil
Sprint-2	Dashboard	USN-4	As a user, I will be given an optional video demo about how to use the system	10	High	Ayush & Aasif
Sprint-2		USN-5	As a user, I can upload an image of the affected area	10	High	Samir and Sushil

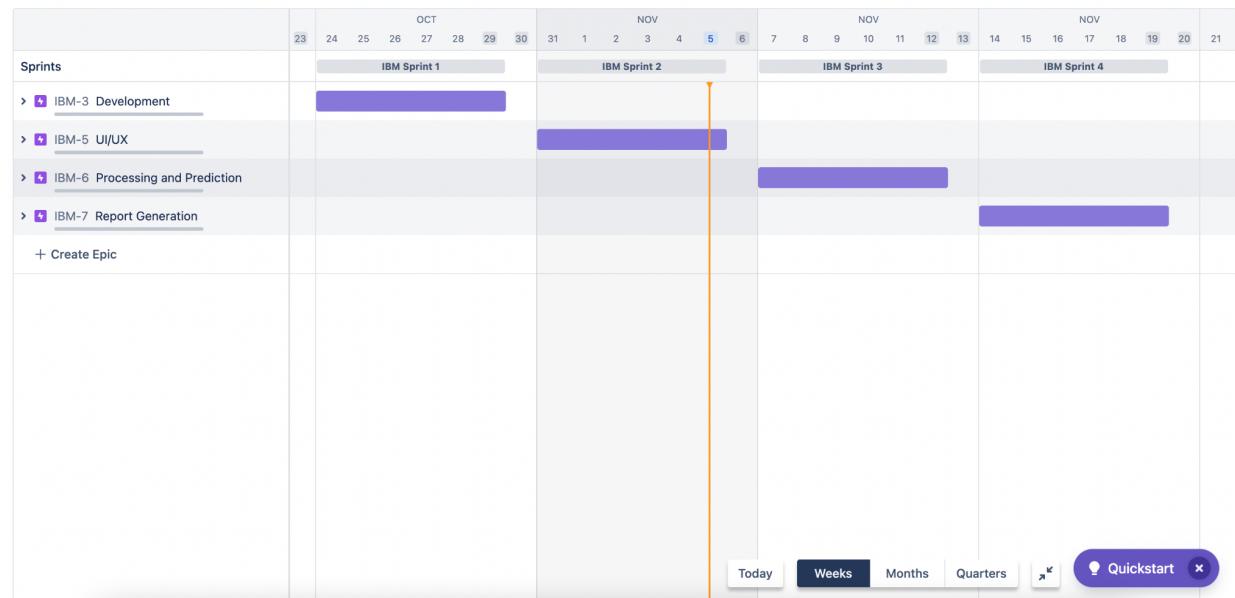
Sprint-3	Image Processing		The image uploaded by the user will be pre-processed and subsequently fed into the trained YOLO model.	10	Medium	Sushil & Ayush
Sprint-3			Model will localize the infected area if found	10	High	Samir & Aasif
Sprint-4	Report Generation	USN-6	As a user, I will be provided the report containing information of my skin disease if found	5	Medium	Ayush & Aasif

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-4		USN-7	As I will be able to see the localized region if found by the model	5	High	Ayush
Sprint-4	Sending email	USN-8	Report of the prediction will be sent to the email address provided by the user	5	High	Aasif
Sprint-4		USN-9	User will be able to download the localized image and can log out.	5	High	Samir & Sushil

Project Tracker, Velocity & Burndown Chart:

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

6.3 Reports from JIRA:



IBM Software project

PLANNING

- Roadmap
- Backlog**
- Board

DEVELOPMENT

- Code

Project pages

Add shortcut

Project settings

You're in a team-managed project

Learn more

Does your team need more from Jira? Get a free trial of our Standard plan.

Projects / IBM Backlog

Search AI Epic Insights

IBM Sprint 3 7 Nov – 12 Nov (1 issue)

IBM-8 Image Processing PROCESSING AND PREDICTION

+ Create issue

IBM Sprint 4 14 Nov – 19 Nov (2 issues)

IBM-9 Report Generation REPORT GENERATION

IBM-10 Sending Email REPORT GENERATION

+ Create issue

Start sprint ...

TO DO ...

TO DO ...

Quickstart x

This screenshot shows the Jira Backlog interface for the 'IBM' project. The sidebar on the left includes links for Planning (Roadmap, Backlog, Board), Development (Code), Project pages, Add shortcut, and Project settings. A message at the bottom left says 'You're in a team-managed project'. The main area displays the 'Backlog' for the 'IBM' project. It shows two sprints: 'IBM Sprint 3' (7 Nov – 12 Nov) with one issue 'IBM-8 Image Processing' under 'PROCESSING AND PREDICTION'; and 'IBM Sprint 4' (14 Nov – 19 Nov) with two issues 'IBM-9 Report Generation' and 'IBM-10 Sending Email' both under 'REPORT GENERATION'. Each sprint has a 'Start sprint' button and a 'TO DO' dropdown. A 'Quickstart' button is located at the bottom right.

IBM Software project

PLANNING

- Roadmap
- Backlog**
- Board

DEVELOPMENT

- Code

Project pages

Add shortcut

Project settings

You're in a team-managed project

Learn more

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Projects / IBM Backlog

Search AI Epic Insights

IBM Sprint 1 24 Oct – 29 Oct (2 issues)

IBM-1 Registration DEVELOPMENT

IBM-2 Login DEVELOPMENT

+ Create issue

IBM Sprint 2 31 Oct – 5 Nov (1 issue)

IBM-4 Dashboard UI/UX

+ Create issue

Start sprint ...

TO DO ...

TO DO ...

Quickstart x

This screenshot shows the Jira Backlog interface for the 'IBM' project. The sidebar on the left includes links for Planning (Roadmap, Backlog, Board), Development (Code), Project pages, Add shortcut, and Project settings. A message at the bottom left says 'You're in a team-managed project'. The main area displays the 'Backlog' for the 'IBM' project. It shows two sprints: 'IBM Sprint 1' (24 Oct – 29 Oct) with two issues 'IBM-1 Registration' and 'IBM-2 Login' both under 'DEVELOPMENT'; and 'IBM Sprint 2' (31 Oct – 5 Nov) with one issue 'IBM-4 Dashboard' under 'UI/UX'. Each sprint has a 'Start sprint' button and a 'TO DO' dropdown. A 'Quickstart' button is located at the bottom right.

7. CODING and SOLUTIONING:

7.1 Feature 1

- User Registration and Login



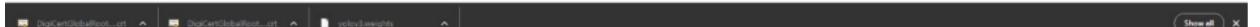
Register!

Full Name

Email

Password

The screenshot shows a Gmail inbox interface. On the left, there's a sidebar with icons for Mail (99+), Chat, Spaces, and Meet. The main area has a search bar at the top. Below it, there are buttons for Compose, Inbox (1,042), Starred, Snoozed, Sent, and More. A Labels section with a '+' sign is also present. In the center, an email from 'baap11102@gmail.com' is displayed. The subject line reads 'Hello !, Sushil'. The body of the email says 'Hey,Sushil Your verification number is 5387'. At the bottom, there are 'Reply' and 'Forward' buttons.





Congratulations! Account Verified

[SignUp](#) [SignIn](#)



Login!

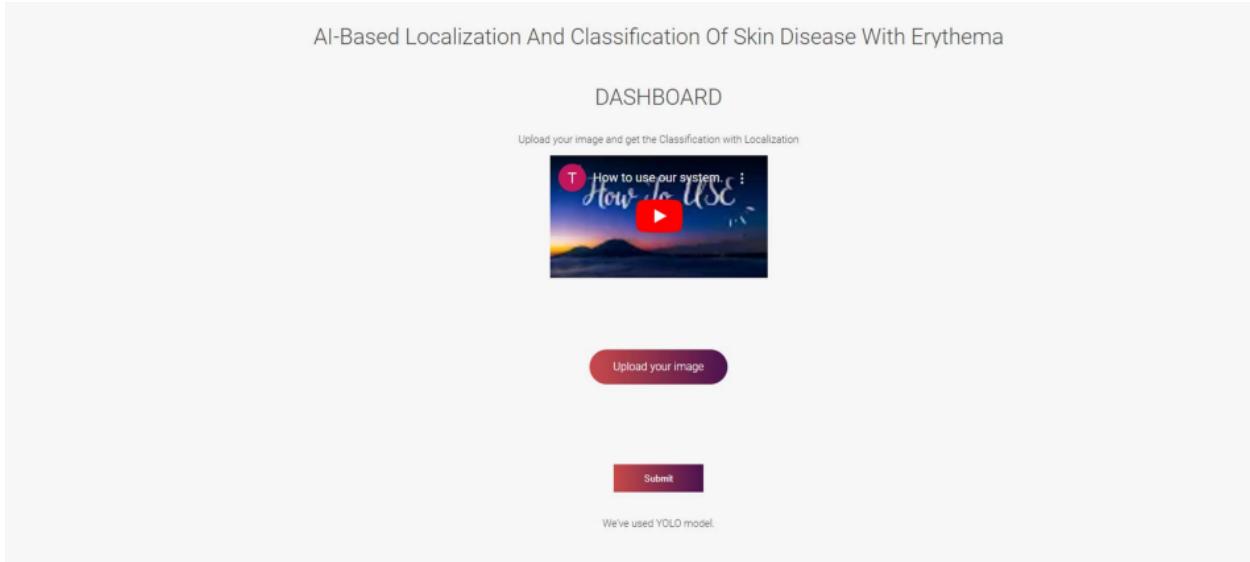
Email address

sushil19554@cse.ssn.edu.in

Password

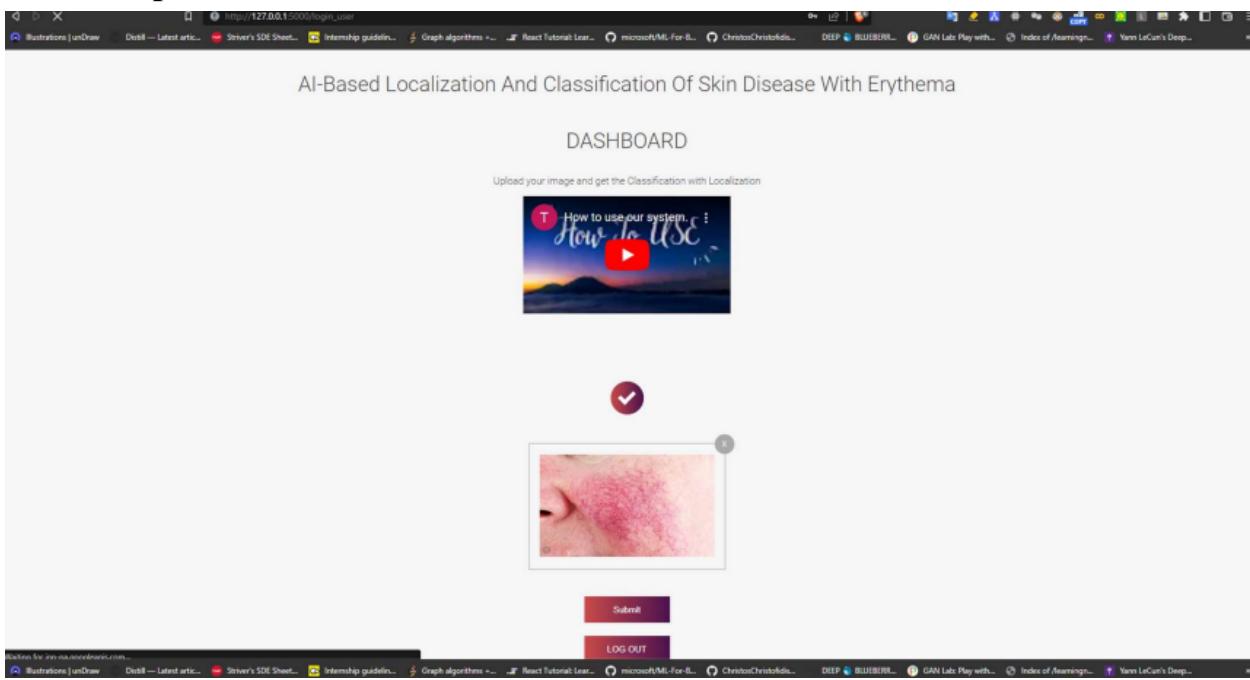
***** ✓

[SIGN IN](#)



7.2.1 Feature 2

- **Picture Upload and Prediction**



AI-Based Localization And Classification Of Skin Disease With Erythema



Result: Rosacea

Confidence: 61.54%

[Download Image](#)

[Use another image](#)

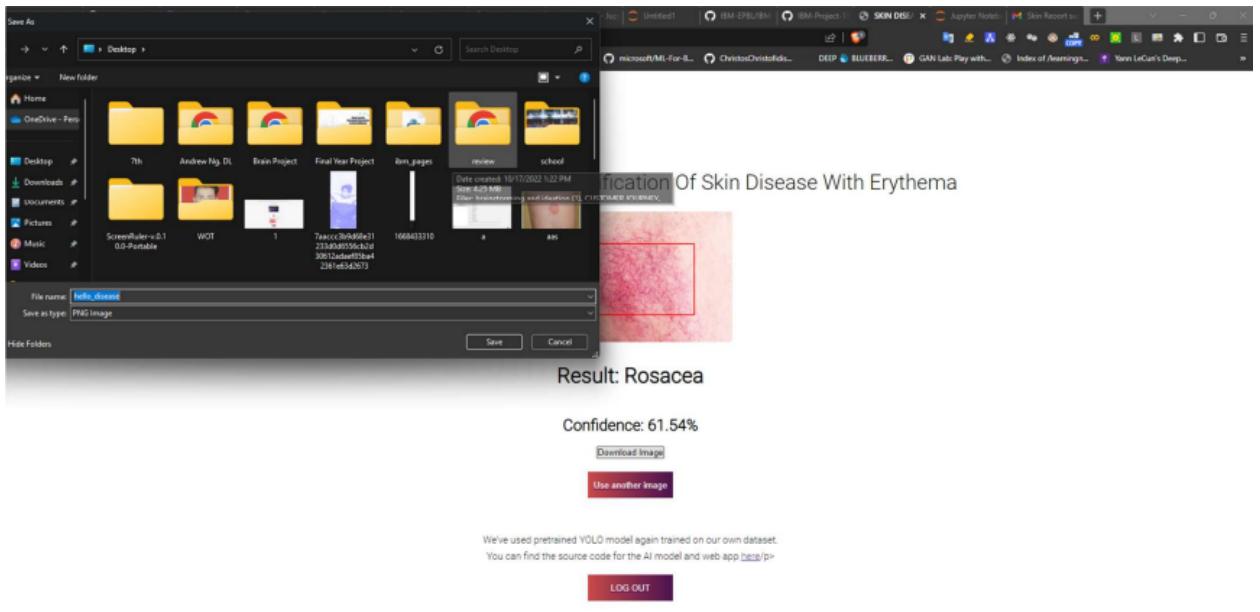
We've used pretrained YOLO model again trained on our own dataset.
You can find the source code for the AI model and web app [here](#).

[LOG OUT](#)

7.2.2 Feature 3

- Report Generation and downloading.





[27/08/15000 download]

7.3 Database Schema:

Table definition

USERS

Approximate 7 rows (32.0 KB)
Updated on 2022-11-19 12:27:45

Name	Data type	Nullable	Length	Scale	
FULL_NAME	VARCHAR	N	255	0	⌚
EMAIL	VARCHAR	N	255	0	⌚
PASSWORD	VARCHAR	N	255	0	⌚
CODE	VARCHAR	Y	255	0	⌚
VERIFIED	VARCHAR	Y	255	0	⌚

[View data](#)

8. TESTING:

8.1 TEST CASES

				03-Nov-22 PNT2022TMID53159 Project - AI-Based Localization And 4 marks					
Test case ID	Feature Type	Component	Test Scenario	Steps To Execute	Test Data	Expected Result	Actual Result	Status	BUG ID
LoginPage_TC_OO1	Functional	Home Page	Verify user is able to see the Login/Signup popup when user clicked on My account button	1.Enter URL and click go 2.Verify login/Singup popup displayed or not	http://127.0.0.1:5000/	Login/Signup popup should display	Working as expected	Pass	NO
LoginPage_TC_OO2	UI	Home Page	Verify the UI elements in Login/Signup popup	1.Enter URL and click go 2.Verify login/Singup popup with below UI elements: a.email text box b.password text box c.Login button d.New customer? Create account link	http://127.0.0.1:5000/	Application should show below UI elements: a.email text box b.password text box c.Login button with orange colour d.New customer? Create account link	Working as expected	Pass	NO
LoginPage_TC_OO3	Functional	Home Page	Verify the email verification service is working properly	1. Register with valid email 2. Verify that verification box is shown 3.Email is received 4.Submit button is shown and clicked	Wrong Verification code entered	It should give message saying wrong verification message	Working as Expected	Pass	NO
				1. Register with valid email 2. Verify that verification box is shown 3.Email is received 4.Submit button is shown and clicked		It should give message saying Account Verified			
LoginPage_TC_OO4	Functional	Home Page	Verify the email verification service is working properly	1. Register with valid email 2. Verify that verification box is shown 3.Email is received 4.Submit button is shown and clicked	Correct Verification code entered as received	It should give message saying Account Verified	Working as Expected	Pass	NO
LoginPage_TC_OO4	Functional	Home page	Verify user is able to log into application with Valid credentials	1.Enter URLand click signin 3.Enter Valid username/email in Email text box 4.Enter valid password in password text box 5.Click on signin button	Username: sushil.khadka.anon@gmail.com password: sushil	User should navigate to user account homepage	Working as Expected	Pass	NO
LoginPage_TC_OO5	Functional	Login page	Verify user is able to log into application with InValid credentials	1.Enter URLand click signin 3.Enter Valid username/email in Email text box 4.Enter valid password in password text box 5.Click on signin button	Username: chalam@gmail.com password: Testing123	Application should show 'Incorrect email or password' validation message.	Working as Expected	Pass	NO
LoginPage_TC_OO6	Functional	Login page	Verify user is able to log into application with InValid credentials	1.Enter URLand click signin 3.Enter Valid username/email in Email text box 4.Enter valid password in password text box	Username: chalam@gmail.com password: Testing123678686786876876	Application should show 'Incorrect email or password' validation message.	Working as Expected	Pass	NO
LoginPage_TC_OO5	Functional	Login page	Verify user is able to log into application with InValid credentials	1.Enter URLand click signin 3.Enter Valid username/email in Email text box 4.Enter valid password in password text box 5.Click on signin button	Username: chalam password: Testing123678686786876876	Application should show 'Incorrect email or password' validation message.	Working as Expected	Pass	NO

8.2 USER ACCEPTANCE TESTING

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the [AI-based localization and classification of skin disease with erythema] project at the time of the release to User Acceptance Testing (UAT).

2. Defect Analysis

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

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	4	1	1	1	8
Duplicate	0	0	3	0	0
External	1	0	0	0	0
Fixed	5	1	0	0	6
Not Reproduced	0	0	0	0	0
Skipped	0	0	0	0	0
Won't Fix	0	0	0	0	0
Totals	10	2	4	1	14

3. Test Case Analysis

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

Section	Total Cases	Not Tested	Fail	Pass
Login	4	0	0	4
Registration and Verification	4	0	0	4
Prediction	3	0	0	3

9 RESULTS:

9.1 PERFORMANCE TESTING

Model Performance Testing:

Project team shall fill the following information in model performance testing template.

S.No.	Parameter	Values	Screenshot
1.	Model Summary	<p>The model is YOLO v3 pretrained and gain trained on our custom dataset of skin diseases.</p> <p>It is a real-time object detection algorithm that identifies specific objects in videos, live feeds, or images. And it uses features learned by a deep convolutional neural network to detect an object.</p>	<pre>leaky_re_lu_71 (LeakyReLU) (None, None, None, 6 ['batch_normalization_71[0][0]') 256) conv2d_58 (Conv2D) (None, None, None, 261375 ['leaky_re_lu_57[0][0]') 255) conv2d_66 (Conv2D) (None, None, None, 130815 ['leaky_re_lu_64[0][0]') 255) conv2d_74 (Conv2D) (None, None, None, 65535 ['leaky_re_lu_71[0][0]') 255) ===== Total params: 62,061,757 Trainable params: 61,949,149 Non-trainable params: 52,688 None WARNING:tensorflow:compiled the loaded model, but the compiled metrics have yet to be built. `model.compile` must be called before metrics can be used. Saved keras model to yolo.h5 Read 62001757 of 62001757.0 from Darknet weights. E:\yolo_structure\2_Training\src\keras_yolo></pre>
2.	Loss	<p>Training Loss – 27.69</p> <p>Validation Loss – 38.5</p> <p>(Early stopped)</p>	<pre>Epoch 69/102 64/64 [=====] - 452s 7s/step - loss: 27.5562 - val_loss: 36.8917 Epoch 70/102 64/64 [=====] - 516s 8s/step - loss: 28.2189 - val_loss: 36.5924 64/64 [=====] - 528s 8s/step - loss: 27.8759 - val_loss: 35.0793 Epoch 00071: ReduceLROnPlateau reducing learning rate to 1.0000000116866975e-08. Epoch 72/102 64/64 [=====] - 646s 10s/step - loss: 27.6699 - val_loss: 38.5444 Epoch 00072: early stopping (base) PS E:\IBM_yolo\yolo_structure\2_Training> %load_ext tensorboard</pre>
3.	Confidence Score (Only Yolo Projects)	<p>Class Detected – Rosacea, Psoriasis & Melanoma</p> <p>Confidence Score –</p>	

		<p>61.5% for first Image (Rosacea),</p> <p>87.6% for Second (Psoriasis)</p> <p>83.09% for third (Melanoma)</p>	<pre>(416, 416, 3) Found 1 boxes for img Rosacea 0.62 (160, 124) (683, 399) Time spent: 1.306sec -22.253526576474542 -12.790271922643626 Processed 1 images in 1.5sec - 0.7FPS</pre>  <p>Result: Rosacea Confidence: 61.54%</p> <pre>(416, 416, 3) Found 1 boxes for img psoriasis 0.88 (27, 109) (318, 308) Time spent: 1.546sec 77.30558211247515 -105.28502202044177 Processed 1 images in 1.6sec - 0.6FPS</pre>  <p>Result: Psoriasis Confidence: 87.6%</p> <pre>(416, 416, 3) Found 1 boxes for img melanoma 0.83 (387, 113) (756, 589) Time spent: 2.051sec -9.026176998835851 154.7110427447168 Processed 1 images in 2.1sec - 0.5FPS</pre>  <p>Result: Melanoma Confidence: 83.09%</p>
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10. ADVANTAGES AND DISADVANTAGES:

ADVANTAGES:

- a. Speed – This website is fast and doctors do not manually need to diagnose disease if the confidence score is high.
- b. Maintenance – This website runs with relatively low maintenance under IBM Cloud.
- c. User Friendly – The UI of the application is highly user friendly and the navigation in the website is smooth.
- d. Fast Results – The response time of the application is negligible and makes the whole classification and localization process easy.

DISADVANTAGES:

- a. Low Confidence – The result may not always be reliable if the confidence score is low.
- b. Maintenance – The model needs to be trained from time to time with new data to improve the performance of the model.
- c. Privacy – The model needs access to personal information such as medical history and photographs which can raise privacy concerns.
- d. More than 1 class - The model sometimes shows more than 1 class and regions which may be confusing for users.

11. CONCLUSION

The whole process of diagnosing skin disease is automated with a Deep Learning Model. It is an efficient and hassle-free way of detecting disease which is implemented using Deep Learning framework Keras/Tensorflow and the web framework Flask. To ensure smooth functioning of the website operation, the database has been hosted on IBM Cloud.

The application has also integrated mailing system to automate the mailing procedure of verification code and report.

12. FUTURE SCOPE

The model can be trained for more than 3 classes of skin disease but at the expense of collecting huge amounts of data (i.e images). Upgrading to a smooth UI will help users in understanding the working of the app. It will surely help in adding more users to the community.

12. APPENDIX

Github :

<https://github.com/IBM-EPBL/IBM-Project-13784-1659530238>

Video Demo:

https://drive.google.com/file/d/1c9-TcH5JenZzut3rJEDs2OMnw_hotCl1/view?usp=share_link

Dataset:

https://drive.google.com/drive/folders/1cqL9rR3OnUjF2gD-ocJ_F_H3x6wrZkv0?usp=share_link

Source Code:

https://drive.google.com/drive/folders/1wIGL4p8F2ZlnSSeDm-YLnhHej4vj-dic?usp=share_link