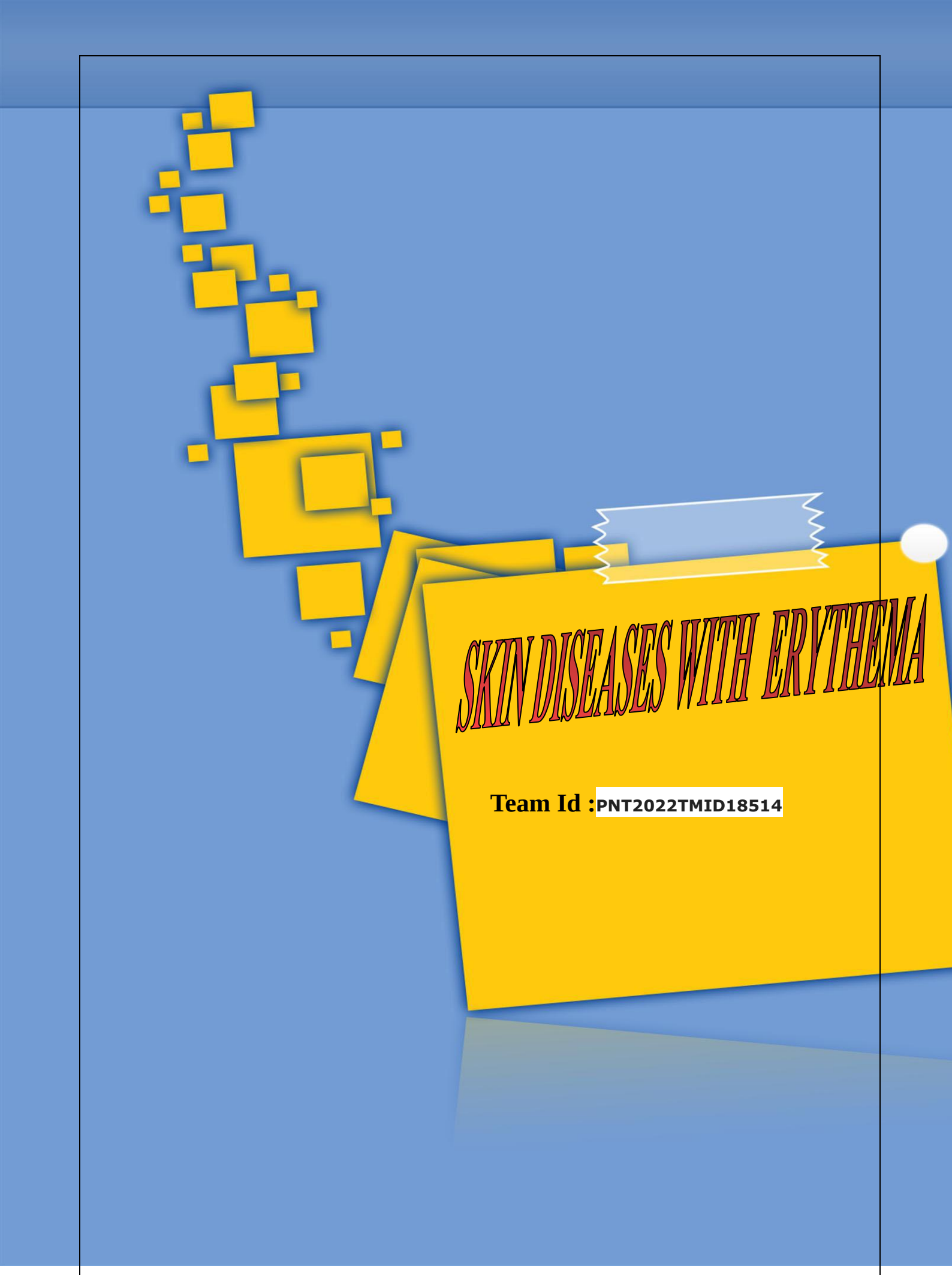

Team Id : PNT2022TMID18514

AI-BASED LOCALISATION AND CLASSIFICATION OF SKIN DISEASES WITH ERYTHEMA

PROJECT REPORT

Submitted by

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ABSTRACT

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.Hence an website app has been developed to detect and easy diagnosis of skin diseases. The extraction of features plays a key role in helping to classify skin diseases. Computer vision has a role in the detection of skin diseases in a variety of techniques.

TABLE OF CONTENTS

INTRODUCTION

1.INTRODUCTION

1.1. AIM

- To know the fundamental concepts and techniques of the web application with Artificial Intelligence and YOLO structure
- To gain a broad understanding of image data for app development using explicit intent
- To work with OPENCV capabilities
- To work with image processing techniques
- To know how to build a web application using the opencv framework.

1.2. OBJECTIVE

To Localize and Classify the skin images which is affected by erythema by using:

- An web application is build using opencv frame work
- a YOLO model structure which is used for training
- Microsoft's Visual Object Tagging Tool (VoTT) is used to annotate images
- Keras ,TensorFlow and OPENCV are used for building models.

1.3 SKIN DISEASES WITH ERYTHEMA:

Computer-aided diagnosis (CAD) is a computer-based system that is used in the medical imaging field to aid healthcare workers in their diagnoses1. CAD has become a mainstream tool in several medical fields such as mammography and colonography. However, 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. Furthermore, classification of a disease is difficult due to the strong similarities between common skin disease symptoms. Therefore, it would be beneficial to exploit the strengths of CAD using artificial intelligence techniques, in order to improve the accuracy of dermatology diagnosis.

1.4 APPLICATION DEVELOPMENT :

Android is a software package and linux based operating system for mobile devices such as tablet computers and smartphones. Here we have used an Web app to detect the skin diseases. By training the model using yolo structures ,the app is able to detect the diseases. In app development ,we have used flask and cloudant db to build the application.

PART 2

AI-BASED LOCALISATION AND CLASSIFICATION OF SKIN DISEASES WITH ERYTHEMA

2.1 PROBLEM DESCRIPTION

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 are more common than other diseases. Skin diseases may be caused by fungal infection, bacteria, allergy, or viruses, etc. The advancement of lasers and Photonics based medical technology has made it possible to diagnose the skin diseases much more quickly and accurately. But the cost of such diagnosis is still limited and very expensive. So, image processing techniques help to build automated screening system for dermatology at an initial stage. The extraction of features plays a key role in helping to classify skin diseases. Computer vision has a role in the detection of skin diseases in a variety of techniques.

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.

Hence in our project we have used flask to diagnosis skin diseases.

Hence to overcome the above problem we are building a web app 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. This app analyses the image and detect whether the person is having skin disease or not.

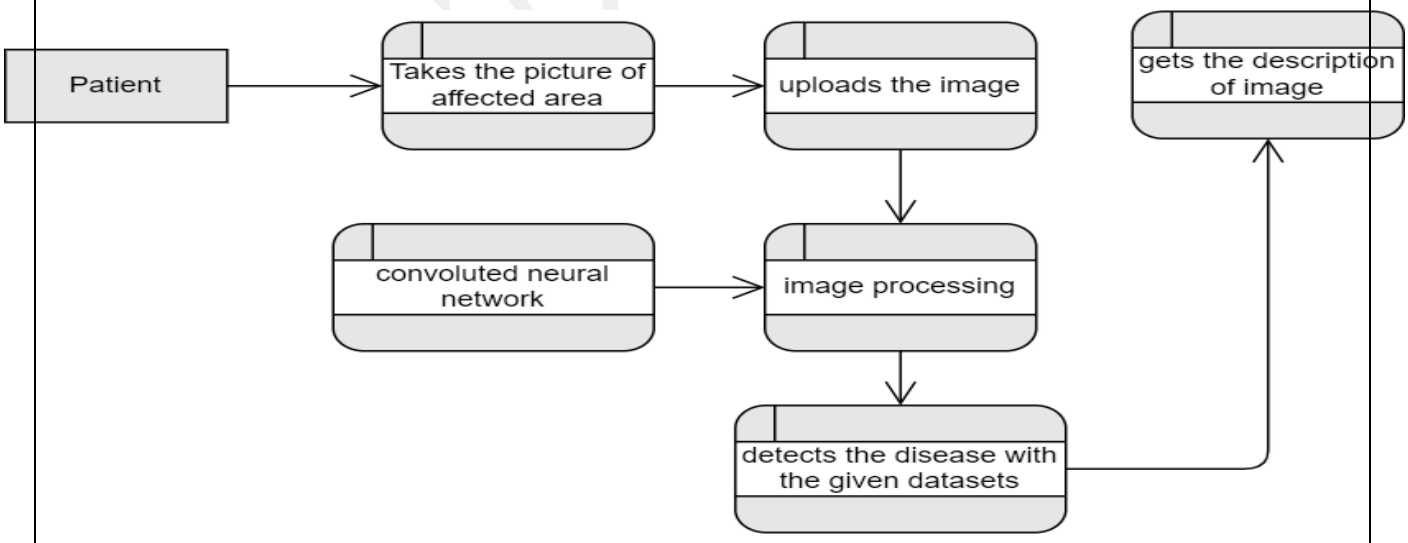
2.2 DATASET:

Here we have used Dermnet dataset. The images in these datasets were obtained with a special dermatoscopic device. These devices create high-resolution images with the skin disease located near the center. This dermnet dataset has 8 classes of skin diseases .These training images were taken and preprocessed.

Using this dataset ,we are going to annotate the images and train the model.

2.3 MODULES

BLOCK DIAGRAM



DATA SELECTION:

The first step of our project is to select the data. The data should be selected such that it should produce efficient results. Data selection is the **process where the data relevant to the analysis is retrieved from the database**. Sometimes data transformation and consolidation are performed before the data selection process. Data is the key ingredient to any analytical exercise and so selection of data have great impact on analytical model to be built.

DATA PREPROCESSING:

Data preprocessing is a data mining technique which is used to **transform the raw data in a useful and efficient format.** The tasks in data preprocessing include Data cleaning, Data integration, Data transformation, Data reduction, Data discretization. In our project, we have used data cleaning method to identify the missing values and clean them accordingly.

TRAINING THE MODEL:

Here we have used YOLO You Only Look Once – Real Time Object Detection,pre-trained model for training. 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.

ANNOTATION OF IMAGES

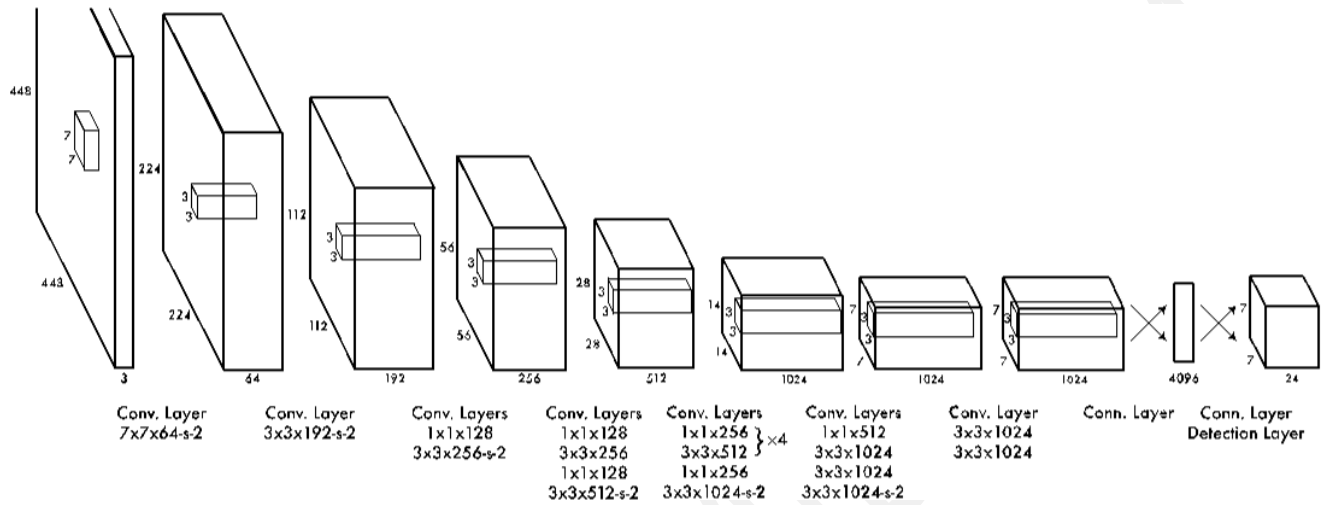
Microsoft Visual Tagging Tool is used for annotation of images.Annotation of images is needed in OPENCV to train,validate and test the model.It is the most significant step for training images.Each image in the dataset is accurately labelledto recognize similar objects like a human can.Here VTT tool is used.It helps of labeling or classifying an image using text,annotation tools or both,to show the data features needed to be extracted.It helps to recognize objects and boundaries and to segment images for instance ,or whole image.

WEB APPLICATION

Here an web app is developed where the user has to take pictures of the affected area in the skin and upload the image in the app.Other way is the user can capture the image and store in the files and pick directly from the files through external storage services.Once analyse button is clicked ,the user gets the description of skin disease in which he is affected.He also gets localized area in which it is affected.

4 .YOLO STRUCTURE

YOLO ARCHITECTURE



YOLO You Look Only Once 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.

This architecture takes an image as input and resizes it to *448*448* by keeping the aspect ratio same and performing padding. This image is then passed in the CNN network. This model has 24 convolution layers, 4 max-pooling layers followed by 2 fully connected layers. For the reduction of the number of layers (Channels), we use *1*1* convolution that is followed by *3*3* convolution. Notice that the last layer of YOLOv1 predicts a cuboidal output.

5. LITERATURE SURVEY

Literature Survey

AI-based localization and classification of skin disease with Erythema

Survey : 1

Research Article Title	Automatic skin disease diagnosis using deep learning from clinical image and patient information
Authors	K. A. Muhaba,K. Dese,T. M. Aga,F. T. Zewdu,G. L. Simegn
Published Date	25 November 2021
Problem Addressed / Identified	The most prevalent diagnosis approach for illnesses is visual assessment in conjunction with clinical information. Manual skin disease diagnosis takes time, requires skill and great visual acuity, and is prone to error.
Aim & Objectives	A deep learning pre-trained mobilenet-v2 model is provided for the automated diagnosis of five common skin diseases using data from clinical photos and patient information.
Model / Algorithm Used	Mobilenet-v2
Results	Using the suggested technique, a multiclass classification accuracy of 97.5%, sensitivity of 97.7%, and precision of 97.7% has been attained for the common five skin diseases.
Reference	**https://onlinelibrary.wiley.com/doi/full/10.1002/ski2.81**

Survey : 2

Research Article Title	**A Method Of Skin Disease Detection Using Image Processing And Machine Learning**
Authors	Nawal Soliman ALKolifi ALEnezi
Published Date	2019
Problem Addressed / Identified	The advancement of lasers and Photonics based medical technology has made it possible to diagnose the skin diseases much more quickly and accurately. But the cost of such diagnosis is still limited and very expensive.
Aim & Objectives	Proposed an image processing-based approach to diagnose the skin diseases. This method takes the digital image of disease effect skin area then use image analysis to identify the type of disease.
Model / Algorithm Used	AlexNet (CNN)
Results	Initially, the input images are preprocessed, then features are extracted using pretrained CNN. Finally, classification is performed using SVM classifier. The system was tested on six types of skin diseases with accuracy of 95%.
Reference	**https://www.sciencedirect.com/science/article/pii/S1877050919321295**

Survey 3:

Research Article Title	**A Method Of Skin Disease Detection Using Image Processing And Machine Learning**
Authors	Nawal Soliman ALKolifi ALEnezi
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Model / Algorithm Used	AlexNet (CNN)
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Reference	**https://www.sciencedirect.com/science/article/pii/S1877050919321295**

Survey: 4

Research Article Title	**Multiclass skin cancer classification using EfficientNets – a first step towards preventing skin cancer**
Authors	KararAliac, Zaffar Ahmed Shaikha, Abdullah AyubKhan, Asif Ali Laghari
Published Date	December 6, 2021
Problem Addressed / Identified	The dermatologist's experience limits the visual examination of dermatoscopic pictures. Due to the subjectivity of human decisionmaking, alongside high inter-class similarity in skin lesions and other complicating factors, this method is prone to mistakes. To better mimic and maybe exceed medical experts, an automated computer system must engage in vast amounts of visual exploration utilising historical data
Aim & Objectives	To examine the EfficientNets B0-B7's classification abilities using the HAM10000 dataset of dermatoscopic pictures. 10015 photos from seven different skin cancer classes—akiec, bcc, bkl, df, mel, nv, and vasc—make up the dataset.
Model / Algorithm Used	EfficientNets B0-B7
Results	By performing transfer-learning on the pre-trained weights of ImageNet and adjusting the Convolutional Neural Networks, they trained the EfficientNets B0-B7 on the HAM10000 dataset. They assessed the performance of all EfficientNet variations on this unbalanced multiclass classification issue using metrics such as Precision, Recall, Accuracy, F1 Score, and Confusion Matrices in order to examine the effects of transfer learning and fine-tuning. For each of the eight models, the study displays the per-class classification scores as Confusion Matrices. Our most reliable model, EfficientNet B4, in particular, achieved an 87 percent F1 Score and an 87.91 percent Top-1 Accuracy
Reference	https://www.sciencedirect.com/science/article/pii/S2772528621000340

Survey: 4

Research Article Title	**Assisted deep learning framework for multi-class skin lesionclassification considering a binary classification support**
Authors	Balazs Harangi Agnes Baran, AndrasHajdu
Published Date	26 June, 2020
Problem Addressed /Identified	Skin cancer is a frequent and locally damaging type of malignant development. It comes from the cells that are arranged in a row along the membrane that divides the outermost layer of skin from the deeper layers. Because pigmented lesions are found on the skin's surface, a clinical professional can visually check one to identify malignant behaviour (such as melanoma) early. However, the majority of the timeit goes unnoticed, which has serious health consequences
Aim & Objectives	In this paper they proposed a CNN architecture, which is simultaneously trained to solve a binary and a multi-class classification problem, where the two classes of the binary task represent the benign/malignant classes of the original 7-class skin lesion classification problem
Model / Algorithm Used	GoogLeNet Inception-v3
Results	They have simultaneously trained the identical CNN architecture (GoogleNet Inception-v3) for a binary and multi-class challenge by merging their softmax outputs on a support training layer and multiplying the multi-class confidences with the corresponding binary ones. By doing this, They have significantly improved a 7-class classification issue with regard to skin lesions. When the classes cannot be combined directly into fewer classes, Their method has a natural constraint. However, by using a non-supervised technique like k-means clustering, this problem can be solved.
Reference	**https://www.sciencedirect.com/science/article/pii/S1746809420301977**

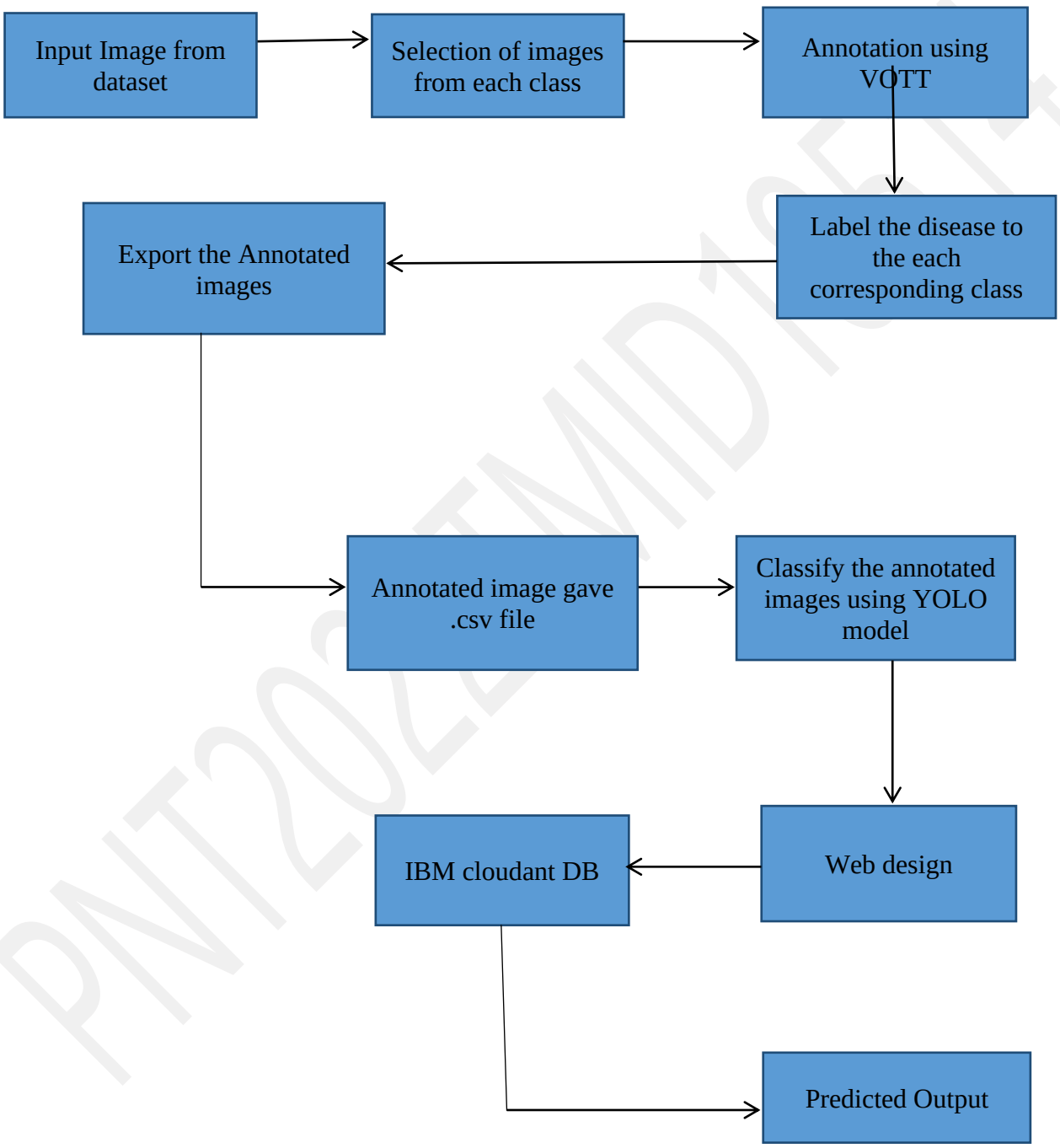
Survey: 4

6.PROPOSED SOLUTIONS

Sno.	Parameter	Description
1.	Problem Statement (Problem to be solved)	User is suffering from skin disease and needs immediate assistance and is unsure of how to handle it.
2.	Idea / Solution description	The User has the ability to take pictures of skin, which are then sent to a trained model. The model examines the photograph and determines whether or not the subject has a skin disease.
3.	Novelty / Uniqueness	Images with noise have also been taken and are enhanced with effective algorithms for predicting the diseases. Using the camera on their device, users may detect and identify their skin issues. This website can process variation of all sizes and forms.
4.	Social Impact / Customer Satisfaction	Different skin disorders can be detected by just submitting photographs, and this approach is quite helpful in assisting people in the community identify infections earlier.
5.	Business Model (Revenue Model)	Our return on assets will be the creation and distribution of a proprietary product that will function as a solution.
6.	Scalability of the Solution	This approach is more scalable because it handles any images type, whatever of resolution, and gives great performance in any circumstances.

Survey: 4

Solution Architecture



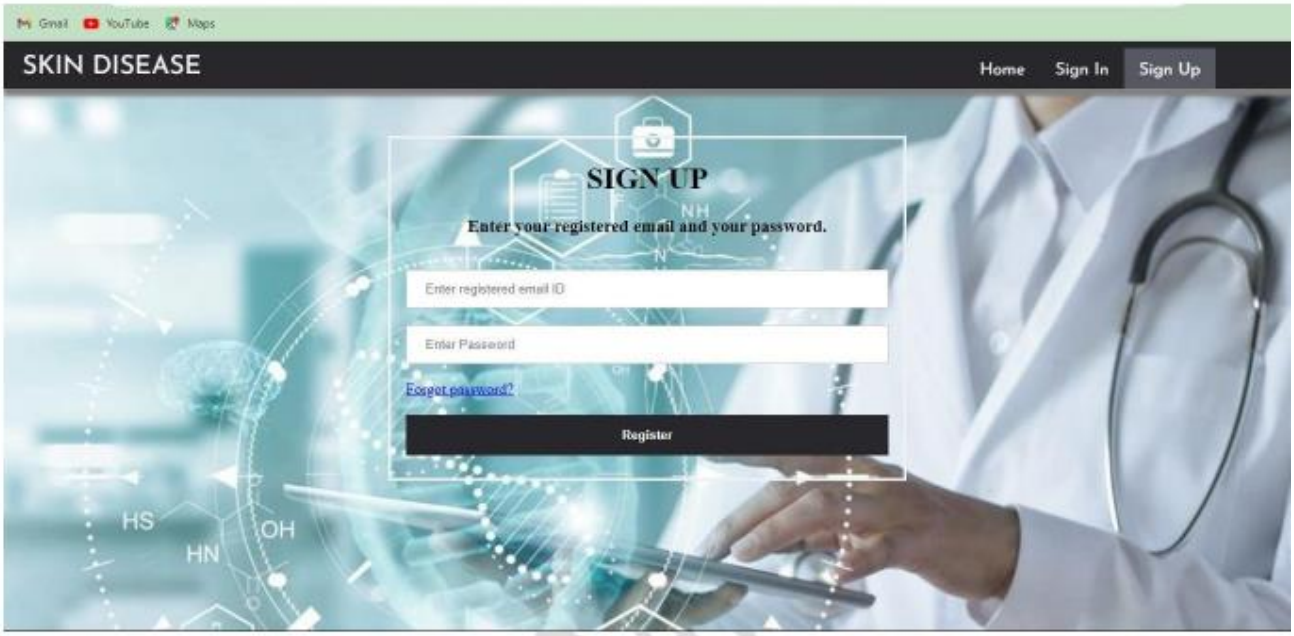
7.OUTPUT SCREEN SHOTS

INDEX page:


SKIN BOSS
Prediction
Log Out
Sign Up
Log In
A PERFECT LIFE WITH PERFECT SKIN
Different types of
Skin Disorders


Gmail
YouTube
Maps
Problem Statement
Now a day's people are suffering from skin diseases, More than 125 million people suffering from Psoriasis also skin cancer rate is rapidly increasing over the last few decades especially Melanoma is most diversifying skin cancer. If skin diseases are not treated at an earlier stage, then it may lead to complications in the body including spreading of the infection from one individual to the other. The skin diseases can be prevented by investigating the infected region at an early stage. The characteristic of the skin images is diversified so that it is a challenging job to devise an efficient and robust algorithm for automatic detection of skin disease and its severity. Skin tone and skin colour play an important role in skin disease detection. Colour and coarseness of skin are visually different. Automatic processing of such images for skin analysis requires quantitative discriminator to differentiate the diseases. To overcome the above problem we are building a model which is used for the prevention and early detection of skin cancer, psoriasis. Basically, skin disease diagnosis depends on the different characteristics like colour, shape, texture etc. Here the person can capture the images of skin and then the image will be sent the trained model. The model analyses the image and detect whether the person is having skin disease or not.
Proposed Solution
Different skin disorders can be detected by just submitting photographs, and this approach is quite effective at helping people in the community identify ailments earlier. Our return on investment will be the creation and distribution of a proprietary product that will be used as a solution. This system is more scalable because it accepts any picture type, regardless of resolution, and offers good performance in any situation.

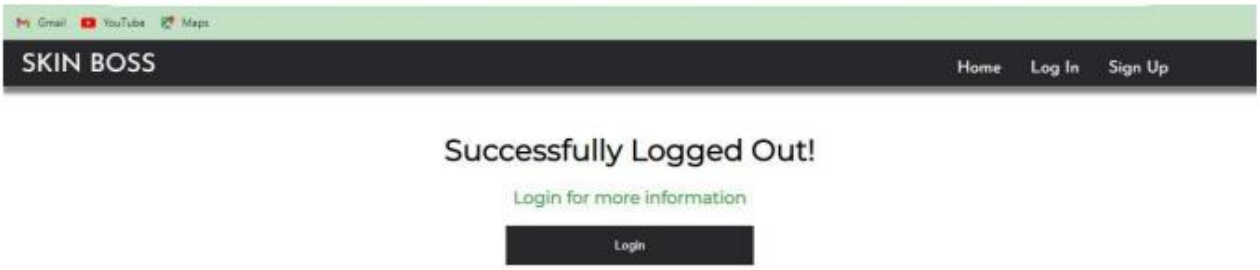
REGISTER page:



LOGIN PAGE:

PREDICTION PAGE:

LOGOUT PAGE



Survey: 4

8.CONCLUSION

Classification of a disease is difficult due to the strong similarities between common skin disease symptoms. Hence an android app has been developed to detect skin diseases and a description of skin skin disease is also given.It is an user friendly app.This approach is more scalable because it handles any images type, whatever of resolution, and gives great performance in any circumstances.Different skin disorders can be detected by just submitting photographs, and this approach is quite helpful in assisting people in the community identify infections earlier.Images with noise have also been taken and are enhanced with effective algorithms for predicting the diseases.Using the camera on their device, users may detect and identify their skin issues. This website can process variation of all sizes and forms.