NOVEL SKIN DISEASE PREDICTION

Submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering degree in Computer Science and Engineering

By

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SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)
Accredited with Grade “A” by NAAC | 12B Status by UGC | Approved by AICTE
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BONAFIDE CERTIFICATE

This is to certify that this Project Report is the bonafide work of **K.Harshith Siddartha (Reg.No-39110559) and M.Prajith Sai(Reg.No-39110576)** who carried out the Project Phase-2 entitled **"NOVEL SKIN DISEASE PREDICTION"** under my supervision from December 2022 to April 2023.

Jeslin

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DECLARATION

I, **Kutumbaka Harshith Siddartha (Reg.No-39110559),** hereby declare that the Project Phase-2 Report entitled "**NOVEL SKIN DISEASE PREDICTION"** done by me under the guidance of **Dr. Jeslin Shanthamalar** is submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering degree in **Computer Science and Engineering**.

DATE: 24.04.23
PLACE:Chennai **SIGNATURE OF THE CANDIDATE**

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ABSTRACT

Skin diseases are very harmful diseases. The symptoms are the rashes in the skin and a change in texture of the skin. Skin diseases are of 2 types. one is temporary and other is permanent. Skin diseases also if not detected at an early stage can lead to major diseases and can eventually prove fatal. So, there is a huge necessity that the diseases be detected at an early stage. There is a huge demand to create a system that can predict whether a person would get diseased or not, alternately, this system can prove to be of major help in hospitals and clinics.

CHAPTER 1

INTRODUCTION

1. INTRODUCTION

Skin disease is defined as a disease which affects the human skin. The symptoms are the rashes in the skin and change in texture of the skin. Skin diseases are of 2 types. one is temporary and other is permanent. The temporary ones usually can be cured in 2-3 months of time if proper medication is taken and the permanent ones are the one that take a longer period to time to get cured. Some of the skin disease are painful and other are painless. Mostly skin disease occurs through improper hygienic practices and some skin diseases are genetic based ones. However, in recent days there are more deaths due to skin diseases. The main reason behind these deaths are carelessness, many people aren't aware of the harmful effects of the skin diseases thus leading to more deaths.

The creation of an expert application of skin disease detection using techniques like Naive Bayes, CNN, and SVM methods was determined from a review of the literature to be extremely necessary to assist all individuals who want to learn about skin diseases that are being experienced or need information about skin diseases. Numerous research papers have been published that describe how to detect these disorders using image processing, and many researchers have made significant contributions. This has prepared the road for our application and pointed us in the proper direction. It would never have been simpler for me to design any application without the earlier work of these colleagues in science. Skin conditions are frequently fairly difficult to identify at an early stage, and it is even more difficult to categorise them independently. Melanoma is now widely recognised as the most serious type ofskin cancer among all others because, if detected and treated early, it has a significantly higher propensity to spread to other regions of the body. Support Vector Machine (SVM), a Machine Learning Algorithm, can be used to categorise certain skin conditions. One of the more common issues in image processing is image classification. Support Vector Machine is a type of machine learning method used to evaluate both structured and unstructured data, including text and images.

It is categorised under supervised learning models. SVM always needs clean data as an input. The challenge in skin disease identification is sorting the photos into many categories of skin illnesses. This paper provides a thorough overview of the machine learning and image processing techniques currently in use for the creation of Android applications that can identify skin diseases. The study is done using a dataset of skindiseases. The best algorithms for detecting skin diseases, according to the literature review, are CNN and SVM. Android application development begins after the technique is established. For each type of skin illness, the ratio of input diseases to detected diseases is determined as part of the results. Figure 1 displays several example pictures of skin conditions.

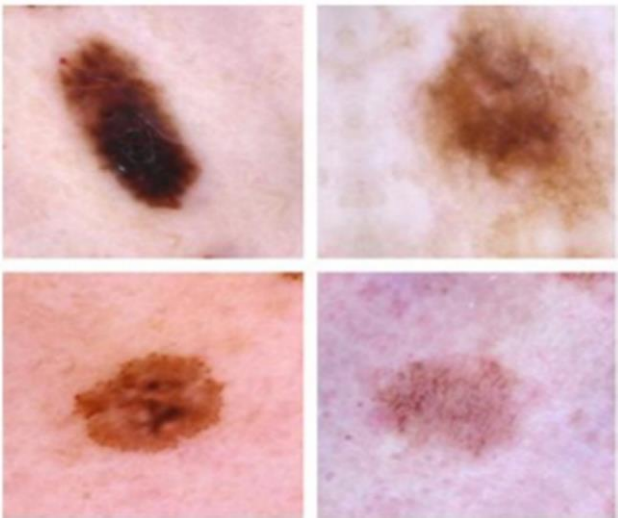


Figure 1 : Sample Skin Disease images

More than 3000 photos of various types of skin diseases from Dermanet were used to train our model. We've built a test model using about 800 identical photographs from the same source. In the world, 2.3 billion android smartphones are in use, which is around one-third of all people. It is therefore the most accessible application. Additionally, occasionally a dermatologist has trouble spotting a disease in its early stages. By using our tool, he is able to at least acquire a general concept of the potential condition.The tool also gives the doctor a dashboard to remotely manage patients and even diagnose a patient's illness from a distance. The methodology component of our study provides an insight into how we identify the skin illness.Additionally, we have outlined numerous techniques and algorithms.

2. OBJECTIVES

- The primary objective of the project is to classify the skin disease and also to suggest a cure to the disease.
- The alternate objective is to create a model that is accurate and as well as fast in predicting the disease.

To develop a machine learning model that accurately predicts the type of skin disease present in a given image of skin, using a dataset of labeled skin images. The model should be able to classify skin diseases into different categories and provide an accurate diagnosis, which can be used to assist dermatologists and medical practitioners in making informed decisions about patient care. The aim is to improve the accuracy and efficiency of skin disease diagnosis, thereby improving patient outcomes and reducing healthcare costs

CHAPTER 2

LITERATURE SURVEY

As we mentioned earlier, there are several papers which are proposed on image-processing based detection of skin diseases. We have reviewed the various techniques mentioned in the literature.

In [1] Arifin, S., Kibria, Firoza, A. Amini & Yan H at el. “Dermatologist Disease Diagnosis using color-skin images”, has proposed a two-stage method to detect the disease based on color texture- based identification and by using a classification to identify the name of the disease. The first stage has the accuracy of 95.99% and the second stage has94.016% accuracy.

In [2] Nawal Soliman, & ALKolifi AlEnezi at el. “A method of skin disease detection using Image Processing and machine learning” has proposed early detection method on image processing based on Convolutional neural network to feature extraction and then using color to identify the features.

In [3] Pravin S. Ambad & A. S. Shirsat at el. “An image analysis System to detect skin diseases” has proposed a system for early identification of skin problem using statistical

analysis and ad boost classifier. Their research mainly focused on early identification of skin cancer symptoms based on statistical analysis with correlation algorithms.

In [4] Li-sheng Wei, Quan Gan, and Tao ji at el. “Skin Disease recognition method based on image color and texture features” has proposed a model based on feature extraction of image using color texture and using segmentation and SVM on it to identify the disease.

In [5] R. Yasir, M S I Nibir and N. Ahmed at el. “A skin disease detection system for financially unstable people in developing countries” has proposed a system for detection of disease which could be implemented on mobile devices as well as computer using desktop application based upon computer vision technique.

In [6] R Sumithra, M Suhilb and D S guruc at el., “Segmentation and classification of skin lesion for disease diagnosis” has proposed a model for segmentation and classification a skin disease using SVM and KNN algorithms.

In [7] Rahat Yasir, Md. Ashiqur Rahman and Nova Ahmed at el. “Dermatological Disease detection using image processing and artificial neural network” has used various kind of different image processing algorithms for feature extraction and feed forwarding using artificial neural network for training and testing the model. The system works on two parts, in the first part the feature extraction has been taken place based upon the color texture and in the second stage the classifier identifies the possible disease.

In [8] Nidhai k, Al Abbadi, Nizzar Saadi at el., “Psoriasis detection using skin color and texture features” has proposed a model for identification of psoriasis using color feature extraction and classification of the skin image.

In [9] Kumar, V., Kumar S., & Saboo, V. at el, “Dermatological disease detection using Image Processing and machine learning” has proposed a model which uses computer vision and machine learning. The features of image are extracted and algorithms are applied ontoit to detect six types of diseases with a accuracy of 95%.

In [10] Pollap D. et al. “An intelligent for monitoring skin disease” has proposed a methodof clustering image using navi for classification. They have used SIFT method for detection of key points in the image. After that they have used CNN and SVM for classification and segmentation. They have a accuracy of 84% and a precision of 82%.

In [12] Abbadi et al.“Psoriasis detection using skin color and texture feature” has mentioned color feature extraction method and texture extraction method to detect psoriasis skin. Color feature are extracted by using own mathematical formula for RGB color. Also, various other texture features are extracted by using various components such as entropy, energy, contract and homogeneity of the image.

In [13] Megha D. Tijare et al. “Detecting skin disease by accurate skin segmentation using various color spaces” has presented a survey paper on how various skin segmentation techniques are helping in detecting of the skin disease. Also mentioned the various steps which are used alongside the detection of these diseases.

In [14] Ekta Singhal et al. Skin cancer detection using Artificial Neural Network has used Segmentation, Feature Extraction and Classification technique to get the result. Segmentation is done using Thresholding, then features are extracted using 2-D wavelet decomposition. And then classification is done using back propagation neural network and radial basic neural network.

In [15] Manish Kumar and Rajiv Kumar et al. an intelligent System to diagnose the skin disease has proposed formulas for image segmentation and then feature extraction of the image. For feature Extraction various parameters are calculated such as mean, Variance, Energy and Entropy from the image.

In [16] Shashi Rekha at al. Digital Dermatology- Skin disease detection model using image processing has proposed a model for detection of six different skin diseases and skin conditions based on method of feature extraction and classification of the image.

In [17], VR Balaji et. al. - Skin disease detection and segmentation using dynamic graph cut algorithm and classification through Naive Bayes classifier, graph cut algorithms are used for image processing of skin images and naïve Bayes algorithm used as a classification algorithm.

In [18], Nawal Soliman et. al. - A Method of Skin Disease Detection Using Image Processing and Machine Learning, used image processing techniques and CNN and SVMalgorithm as machine learning algorithms.

In [19] Sumitra Ra. Et al. segmentation and classification of skin lesions for disease diagnosis has proposed a method for detection of disease by using the combination of SVM and KNN algorithms. Used segmentation and classification methodology to get the accuracy of F-measure 61%.

In [20] Menzis et al. Frequency and morphologic characteristics of invasive melanomas lacking specific surface microscopic features has proposed SVM classifier-based model for identification of melanomas. They used color feature and texture feature extraction to get a sensitivity result 96 % and specificity of 75%.

Many research works are carried out in the skin disease prediction system. The recently carried out works have been explained in detail below. Mobile-based Skin disease detection application was developed since in remote areas, there will be few dermatologists. Image processing is the technology that has been used and it has been found that this system achieves 80 % efficiency, and the average time taken for testing and training is 0.78 seconds and 2.06 seconds respectively. Human skin diseases are various types and some are fatal and some are minor ones

In this paper (P. B. Manoorkar), the classification of human skin diseases is studied and they are categorised under 5 types. The first one is Malignant melanoma and this is a dangerous skin disease and this disease mostly occurs in white countries, the second one is the Genetic Diseases in which the skin diseases will be transmitted genetically, the third one is Leprosy and this disease is transmitted through open skin. This disease mostly occurs in undeveloped and rural areas. The fourth one is viral infectious diseases, which can be easily identified by clinical test and the last one is the most common diseases which is acne and Psoriasis

In (Mayesha Sahir), Image processing is used for the implementation of the skin disease detection and breaking image processing, 3 methods were used, the first one is the histogram processing in which the histograms for a variety of skin diseases is produced using MATLAB and after this step, Color Segmentation is done by segmenting objects in an RGB image and finally.

CNN and traditional way of skin disease prediction systems are analyzed and compared. From the analysis is found that CNN requires larger dataset while the traditional method doesn’t require large dataset and out of other CNN Architecture, CNN With Convolutional 16 filters and 7*7, pooling produced accuracy of 98.32 % sensitivity of 981.5 % , specificity of 98.41 %

SVM based skin disease prediction system is implemented [5] (N Vikranth Kumar) and after the analysis is has been found that SVM is better than Neural networks. The reason why SVM is considered over neural networks is SVM can handle over fitting. The achieved accuracy of the model is about 90 %.ANN is used for the implementation of the system. The reason being ANN is used is ANN can have the capability to learn the patterns, hence it can learn the symptoms of the particular diseases as they form a pattern in [6]

In paper (Kyamelia Roy Sheli Sinha) various image processing techniques are analysed and implemented to find whether the given input image has a skin disease or not. The four image segmentation techniques that are implemented here are Edge detection, Morphology based image segmentation, Adaptive thresholding and Edge detection

CNN is used for the skin disease prediction system implemented in this paper [8]. The dataset has over 1200 images and this dataset is divided into 10 classes. The images are preprocessed and resized in order to fit into our model and these images will be used for validation purposes and also will be used for training purposes. The implemented system can detect up to 8 facial skin diseases. The accuracy achieved in this system is around 88%

In paper , the images are preprocessed and the key skin features are extracted. The key skin features include color, diameter, different surface structures, and sub-surface structures. After extracting the key skin features, the skin changes are monitored over a function of time. The changes are then compared with the threshold value, and if the changes are higher than there is a high possibility of the skin disease occurring and if the change is less than the threshold, the skin condition is normal

2.1. Inferences from Literature Survey

From the above-mentioned literature works, it is clear that there has been effective research on this topic has been done and many models have been proposed. It is evident that the above-mentioned systems have their own pros and cons. While some of the recent works involve hybrid technologies and provide better accuracies, they are still far from what is needed. With higher accuracy, comes the need for low computational costs, high processing speed, and most of all, the convenience of use.

The conclusions that may be derived from the literature review are as follows.

- Most commonly, the support vector machine is utilised for skin disease detectionand prediction.
- SVM has an accuracy range of 80–90%, depending on the dataset.
- The UCI machine repository contains a dataset on skin illnesses that includes hundredsof photos for different skin conditions.

2.2. Open problems in Existing System

Dermatological issues are prevalent in large sections of the society and its diagnosis is not very easy. Besides, it is extensively done with experience. There is an inconsistency of schooling and education in the field at undergraduate level. Thus, the existing systems have been lacking efficiency and advancement. The available procedures for diagnosis consist of long laboratory procedures that require vast set ups and ample amount of time. This makes the existing systems very costly and time-consuming. Due to it being time-consuming, the dataset used to get results from the existing system is also small and hence inappropriate. The systems have become outdated in comparison to other AI and ML based systems that have started to be used in other medical fields. Therefore, there is a need to develop existing systems into more advanced and efficient ones.

CHAPTER 3
REQUIREMENT ANALYSIS

1. FEASIBILITY STUDIES/RISK ANALYSIS OF

THE PROJECT FEASIBILITY STUDY

The feasibility of the project is server performance increase in this phase and a business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis, the feasibility study of the proposed system is to be carried out. For feasibility analysis, some understanding of the major requirements for the system is essential.

Three key considerations involved in the feasibility analysis are

- Economical feasibility
- Technical feasibility
- Operational feasibility

ECONOMICAL FEASIBILITY

This study is carried out to check the economic impact that the system will have on the organisation. The amount of funds that the company can pour into the research and development of the system is limited. The expenditures must be justified. Thus the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customised productshad to-be purchased.

TECHNICAL FEASIBILITY

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands being placed on the client. The developed system must have modest requirements, as onlyminimal or null changes are required for implementing this system.

OPERATIONAL FEASIBILITY

The aspect of the study is to check the level of acceptance of the system by the user.This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity. The level of acceptance by the users solely depends on the methods that are employed to educate the user about the system and to make him familiar with it.His level of confidence must be raised so that he is also able to make some constructive criticism, which is welcomed, as he is the final user of the system.

2. SOFTWARE REQUIREMENTS SPECIFICATION DOCUMENT

Hardware specifications:

- Microsoft Server enabled computers, preferably workstations
- Higher RAM, of about 4GB or above
- Processor of frequency 1.5GHz

oraboveSoftware specifications:

- Python 3.6 and higher
- Anaconda software

3. SYSTEM USE CASE

Another potential use case for a system related to skin disease could be a machine learning model that predicts the likelihood of an individual developing a certain skin disease based on their medical history, lifestyle factors, and other risk factors.

The system could be trained on large datasets of medical records and skin disease diagnoses to identify patterns and risk factors associated with various skin conditions. It could then use this information to generate personalised risk scores for individuals, based on factors such as age, sex, family history, exposure to environmental toxins, and lifestyle factors like smoking and sun exposure.

This information could be used by healthcare providers to identify high-risk individuals and recommend preventive measures, such as regular skin screenings, lifestyle modifications, and targeted interventions to reduce exposure to environmental toxins or other risk factors.

Overall, such a system could help improve early detection and prevention of skin diseases, leading to better health outcomes for individuals and reduced healthcare costs.The website could feature an easy-to-use interface, where users can input theirinformation and receive a personalised risk assessment report. The report could include information on the user's risk of developing various skin conditions, as wellas recommended preventive measures and lifestyle modifications to reduce their risk.

The website could also feature educational resources and information about skin health, such as tips for proper sun protection and skin care, as well as links to healthcare providers or support groups for further assistance.

Overall, such a system could help individuals to better understand their risk of developing skin diseases and take proactive steps towards prevention and early detection. By providing personalised recommendations and educational resources, the system could empower users to take control of their skin health and reduce their risk of developing serious skin conditions.

CHAPTER 4

DESCRIPTION OF PROPOSED SYSTEM

1. SELECTED METHODOLOGY OR PROCESS

MODELGUI & DATA PREPROCESSING MODULE

This is the interface where the user or patient interacts with the application. This UI is built in a simple way so that it will be easy for the users to interact with. In this module, these input parameters are trained well and a model is created. These input parameters have to be trained well in order to obtain a high accuracy. Data preprocessing comprises of 2 steps. In data processing step , the training data is 80% and testing data is 20%.

FLOW OF RESEARCH WORK

The proposed methodology of the research work is as follows (Figure 2):

- The issue is described as a research challenge that contains the target domain, such as the problem of skin disease that has to be addressed, as well as a list of literature reviews that are relevant to this area.
- We looked through 28 papers relating to the prediction of skin diseases on the Scopus and Web of Science platforms. We eliminated 8 papers from our review study because we felt they did not reflect the calibre of the research.
- After conducting a literature review, we discovered that SVM is primarily used when machine learning is being used to categorise skin conditions.
- Support Vector Machine algorithm (SVM) is chosen as a classification technique based on the advice of the literature review. Based on SVM, we developed the issue and the study questions.
- The SVM is used on a dataset of skin diseases, and the results are shown. The proper inference is made.

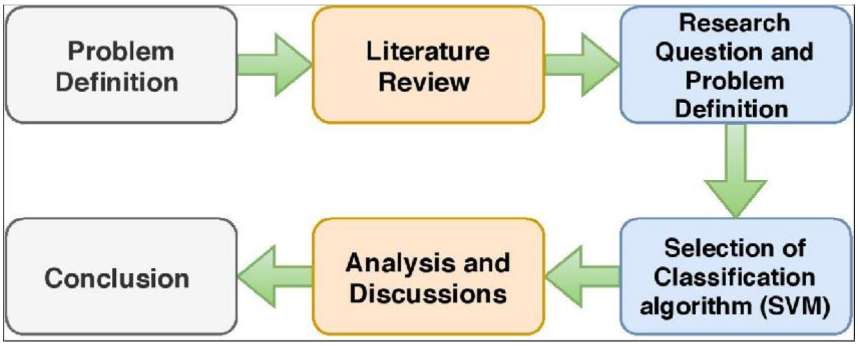
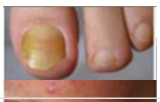


Figure 2: Flow of proposed Research Work

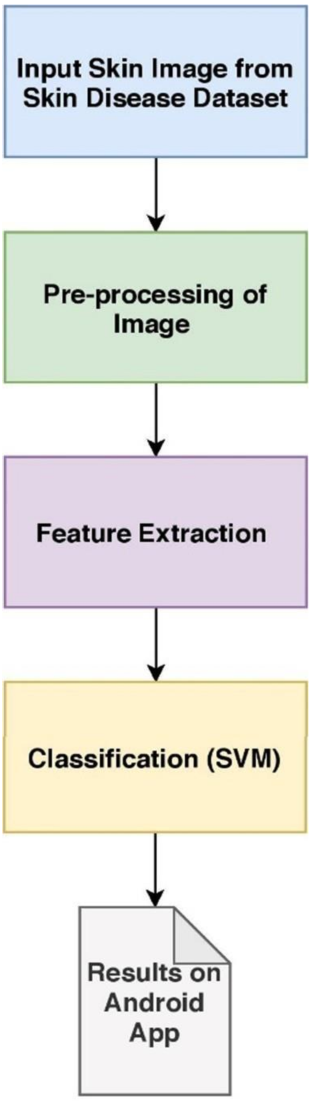
DATASET DESCRIPTION

Our dataset consists of about 3000 photos that we have gathered from other websitesthat are devoted to skin diseases and their treatment in order to make it more accurateand realistic. The training set and test sets were created from the data. Data from the training set is used to train our model, and data from the test set is utilised to determine whether or not it is functioning properly. The sorts of diseases that will be learned for each segment of our dataset are then divided into different groups. Only diseases that have been widespread over the world have been added. However, we will include a lot more expanding illness remedies in future versions. Below table has detailed description of disease dataset.

Table: Skin Disease Dataset

Disease	Sample Images	Numberof Images
Eczema		200
Melanoma		100
Psoriasis		500
Onychosis		150
Acne		300
Corn		150

Classification steps:



SVM classification algorithm flowchart

The workflow of the SVM classification algorithm is shown in the diagram above. The Skin Disease Dataset is used to get the input skin image. It is referred to as the image acquisition phase in Android applications. The picture was grabbed from the Android app's image gallery. The pre-processing entails adjustments to the brightness, contrast, and exact image size. We require a feature extraction method that can work on every layer of a picture. We apply the CNN and SVM technique as aresult of this requirement. The outcomes are shown by the Android software itself.

CNN IMPLEMENTATION

In CNN, the initial step is the convolutional layer and mostly flattened convolutions and 1 * 1 convolutions. but there are totally 7 type of convolutional layers. Then is the ReLU which is abbreviated as Rectified Linear activation function. It's an max function (x, 0) with the input as x. The final layer is the FC (Fully Connected) layer and in this layer only , the output of the CNN will be present.In this implemented system, 2D Conv layer is used and also max pooling is used . The reason why max pooling is chosen over other techniques is, there will be only few number of parameters to learn in the model.

PREDICTION

This is the final module in which the input image given by the user is predicted using the pre-trained model. If the input image has skin disease , "malignant" text will be indicating the presence of skin disease and immediate action has to be taken. If the input image doesn't have skin disease and if the skin is normal "benign" text will be displayed indicating there is no need to worry and the skin seems to be completely fine . Dataset is taken from the kaggle and it contains more than 1000 images.

CLASSIFICATION

Support vector machine algorithm is used which is a statistical analysis algorithm based on statistical theory. This is best suitable for the classification of the various diseases. The SVM method is fed with trained data which helps in identifying the disease. Features are extracted from training datasets (color feature and texture feature). A prebuilt model is used here to identify the disease.

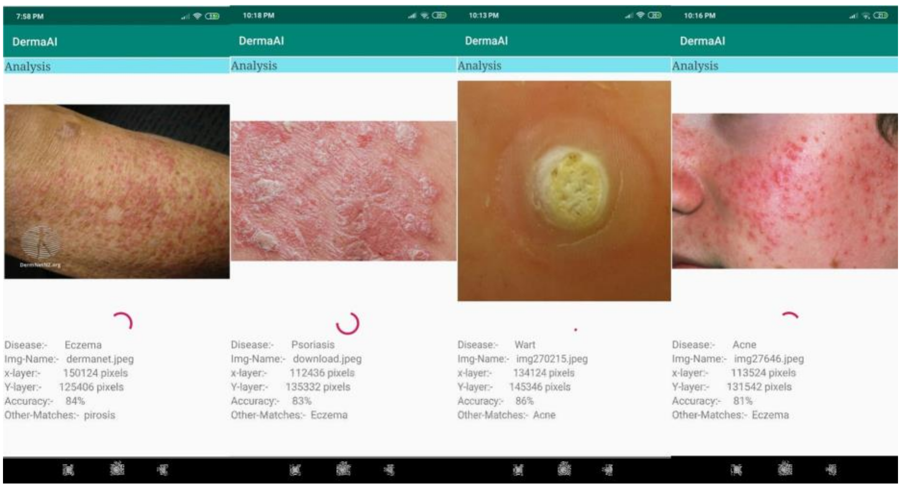


Figure 5: Detection and Analysis of Eczema, Psoriasis, Wart, Acne

2. ARCHITECTURE / OVERALL DESIGN OF PROPOSED SYSTEM

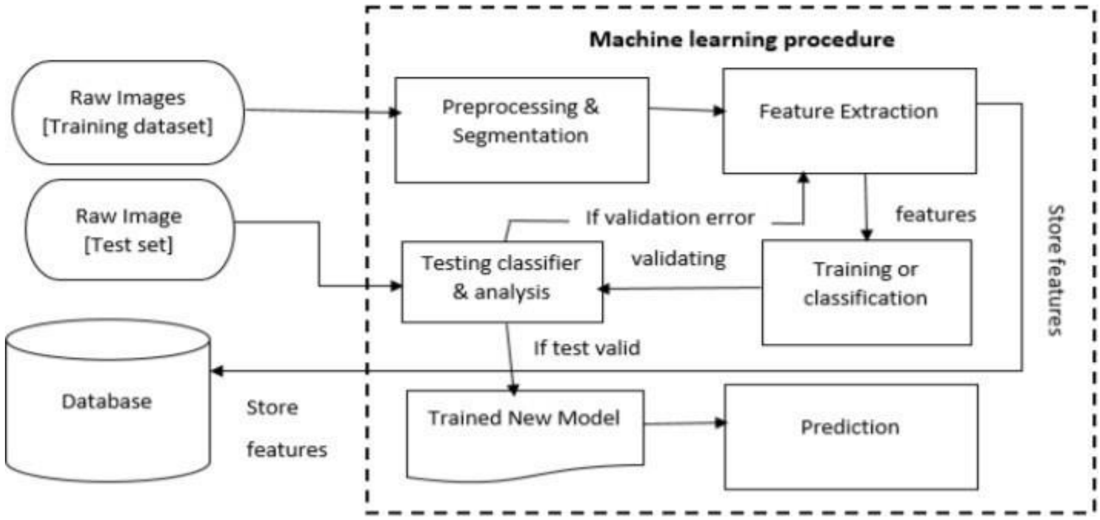


Figure 6: System Architecture

A potential architecture for a skin disease prediction system could involve the following components:

Data collection and preprocessing: The system would need to collect and preprocess data from various sources, including medical records, lifestyle factors, and environmental factors. The data would need to be cleaned, standardised, and normalised before it can be used for machine learning models.

Machine learning models: The system would need to use machine learning models topredict the likelihood of individuals developing various skin diseases based on their medical history, lifestyle factors, and other risk factors. The models could include various algorithms, such as logistic regression, decision trees, and neural networks.

Feature selection and extraction: The system would need to select and extract relevant features from the data, such as age, sex, family history, exposure to environmental toxins, and lifestyle factors like smoking and sun exposure. Feature selection and extraction can help improve the accuracy and efficiency of the machine learning models.

Model training and validation: The system would need to train and validate the machine learning models using large datasets of medical records and skin disease diagnoses. The models would need to be optimized for accuracy, sensitivity, and specificity to ensure reliable predictions.

User interface: The system would need to provide an easy-to-use interface for users to input their information and receive personalized risk assessments. The interface could be a website or mobile application that displays risk scores and recommendations for prevention and early detection.

Integration with healthcare providers: The system could be integrated with healthcare providers to allow for easy access to medical records and facilitate communication between users and providers.

3. DESCRIPTION OF SOFTWARE FOR IMPLEMENTATION AND TESTING PLAN OF THE PROPOSED MODEL/SYSTEM

Anaconda is an open-source package manager for Python and R. It is the most popular platform among data science professionals for running Python and R implementations. There are over 300 libraries in data science, so having a robust distribution system for them is a must for any professional in this field.Anaconda simplifies package deployment and management. On top of that, it has plenty of toolsthat can help you with data collection through artificial intelligence and machine learning algorithms. With Anaconda, you can easily set up, manage, and share Conda environments. Moreover, you can deploy any required project with a few clickswhen you're using Anaconda.There are many advantages to using Anaconda and the following are the most prominent ones among them:Anaconda is free and open- source. This means you can use it without spending any money. In the data science sector, Anaconda is an industry staple. It is open-source too, which has made it widely popular. If you want to become a data science professional, you must know how to use Anaconda for Python because every recruiter expects you to have this skill. It is a must-have for data science.It has more than 1500 Python and Rdata science packages, so you don't face any compatibility issues while collaborating with others. For example, suppose your colleague sends you a project which requires packages called A and B but you only have package A. Without having package B, you wouldn't be able to run the project. Anaconda mitigates the chances of such errors. You can easily collaborate on projects without worrying about any compatibility issues.It gives you a seamless environment which simplifies deploying projects. You can deploy any project with just a few clicks and commands while managing the rest. Anaconda has a thriving community of data scientists and machine learning professionals who use it regularly. If you encounter an issue, chances are, the community has already answered the same. On the other hand, you can also ask people in the community about the issues you face there, it's a very helpful community ready to help new learners. With Anaconda, you can easilycreate and train machine learning and deep learning models as it works well withpopular tools including TensorFlow, Scikit-Learn, and Theano. You can createvisualizations by using Bokeh, Holoviews, Matplotlib, and Datashader while using Anaconda.

How to Use Anaconda for Python

Now that we have discussed all the basics in our Python Anaconda tutorial, let’s discuss some fundamental commands you can use to start using this package manager.

Listing All Environments

To begin using Anaconda, you’d need to see how many Conda environments are present in your machine.

conda env list

It will list all the available Conda environments in yourmachine.Creating a New Environment

You can create a new Conda environment by going to the required directory andusethis command:

conda create -n <your_environment_name>

You can replace <your_environment_name> with the name of your environment.After entering this command, conda will ask you if you want to proceed to which you should reply with y:

proceed ([y])/n)?

On the other hand, if you want to create an environment with a particular version of Python, you should use the following command:

conda create -n <your_environment_name> python=3.6

Similarly, if you want to create an environment with a particular package, you canusethe following command:

conda create -n <your_environment_name>pack_name

Here, you can replace pack_name with the name of the package you want to use.

If you have a .yml file, you can use the following command to create a new Condaenvironment based on that file:

conda env create -n <your_environment_name> -f <file_name>.yml

We have also discussed how you can export an existing Conda environmenttoa .yml file later in this article.

Activating an Environment

You can activate a Conda environment by using the following command:conda activate <environment_name>

You should activate the environment before you start working on the same. Also, replace the term <environment_name> with the environment name you want to activate. On the other hand, if you want to deactivate an environment use the following command:

conda deactivate

Installing Packages in an Environment

Now that you have an activated environment, you can install packages into it by using the following command:

conda install <pack_name>

Replace the term <pack_name> with the name of the package you want to installinyour Conda environment while using this command.

Updating Packages in an Environment

If you want to update the packages present in a particular Conda environment, you should use the following command:

conda update

The above command will update all the packages present in the environment. However, if you want to update a package to a certain version, you will need to use the following command:

c o n d a i n s t a l l

<package_name>=<version>Exporting an

Environment Configuration

Suppose you want to share your project with someone else (colleague, friend, etc.). While you can share the directory on Github, it would have many Python packages, making the transfer process very challenging. Instead of that, you can create an environment configuration .yml file and share it with that person. Now, they cancreate an environment like your one by using the .yml file.

For exporting the environment to the .yml file, you'll first have to activate the sameand run the following command:

conda env export ><file_name>.yml

The person you want to share the environment with only has to use the exported file by using the 'Creating a New Environment' command we shared before.

Removing a Package from an Environment

If you want to uninstall a package from a specific Conda environment, usethe following command:

conda remove -n <env_name><package_name>

On the other hand, if you want to uninstall a package from an activatedenvironment,you'd have to use the following command:

conda remove <package_name>

Deleting an Environment

Sometimes, you don't need to add a new environment but remove one. In such cases, you must know how to delete a Conda environment, which you can do so by using the following command:

conda env remove –name <env_name>

The above command would delete the Conda environment right away.

4. PROJECT MANAGEMENT PLAN

A project management plan for a skin disease prediction system could involve the following steps:

Define project scope and objectives: The first step would be to define the scope and objectives of the project. This would involve identifying the target audience, defining the features and functionalities of the system, and establishing a timeline and budget for the project.

Identify stakeholders: The next step would be to identify the stakeholders involved in the project, such as healthcare providers, patients, and software developers. This would involve establishing communication channels and identifying their needs and expectations.

Define project team and roles: The project team would need to be established, and roles and responsibilities would need to be defined. This would involve identifying team members with expertise in data analysis, machine learning, software development, and user interface design.

Develop project plan: The project plan would need to be developed, including a detailed timeline, budget, and resource allocation. This plan would need to take into account potential risks and contingencies and establish a clear path for achieving project objectives.

Develop data collection and preprocessing plan: The data collection and preprocessing plan would need to be developed, including identifying data sources, establishing data quality standards, and ensuring data privacy and security.

Develop machine learning models: The machine learning models would need to be developed, including selecting appropriate algorithms and features, training and validating the models, and optimizing performance metrics.

Develop user interface: The user interface would need to be designed and developed, including developing wireframes and mockups, testing user experience, and ensuring accessibility and usability.

Conduct testing and validation: The system would need to be tested and validated, including testing functionality, performance, and user experience, and ensuring compliance with industry standards and regulations.

Deploy and monitor: The system would need to be deployed, and monitoring systemswould need to be established to track performance, user feedback, and systemupdates and maintenance.

Evaluate and improve: The system would need to be continuously evaluated and improved based on user feedback and performance metrics, to ensure that it meets the needs and expectations of stakeholders and achieves its objectives.

Overall, a project management plan for a skin disease prediction system would involve a comprehensive and iterative approach to data collection, machine learning model development, user interface design, and testing and validation, with a focus onachieving project objectives and meeting the needs of stakeholders.

5. FINANCIAL REPORT ON ESTIMATED COSTING

Estimating the cost of a skin disease detection system would depend on various factors, including the size and complexity of the system, the technologies used, and the team size and expertise. However, here is a general outline of the estimated costing for a skin disease detection system:

Hardware and software costs: This includes the cost of computers, servers, storage devices, and other hardware needed to support the system. Additionally, software costs would include the cost of software licenses, operating systems, and database management systems.

Data acquisition and preprocessing costs: This includes the cost of acquiring and preprocessing the data needed for the skin disease detection system. Data acquisition may involve acquiring data from various sources such as electronic medical records or image databases. Preprocessing costs may involve data cleaning,normalisation, and feature extraction.

Machine learning model development costs: This includes the cost of developing machine learning models for skin disease detection. This would involve hiring machine learning experts, purchasing machine learning software, and the cost of training and testing the models.

User interface development costs: This includes the cost of developing a user interface that is easy to use and provides accurate results. This would involve hiring user interface designers, front-end developers, and the cost of developing a mobile application or website.

Testing and validation costs: This includes the cost of testing the system for accuracy, reliability, and user experience. This would involve hiring testers, developing test cases, and the cost of validation against medical standards.

Deployment and maintenance costs: This includes the cost of deploying the system, including web hosting and domain registration. Maintenance costs would include server maintenance, software updates, and system backups.

6. TRANSITION/ SOFTWARE TO OPERATIONS PLAN

Transitioning a skin disease prediction software from development to operations requires careful planning and execution to ensure a smooth and successful transition.Here is a plan to transition the software to operations:

Review the software and identify all necessary components for operation, including hardware, software, and data.

Prepare the necessary hardware and software infrastructure to support the operation of the software. This includes setting up servers, storage devices, and network connectivity.

Deploy the software and its components to the production environment. This may involve configuring the software and testing it in a staging environment before going live.

Train and educate the staff responsible for operating the software. This includes training them on how to use the software, how to maintain it, and how to troubleshoot any issues that may arise.

Establish procedures for monitoring the software and its performance. This includes setting up alerts and notifications for any issues or errors that may occur.

Develop and implement a backup and disaster recovery plan. This includes establishing regular data backups and testing the recovery process to ensure that thesystem can be quickly restored in case of an emergency.

Ensure compliance with regulatory and legal requirements. This includes complying with data privacy and security regulations, as well as any other relevant laws and regulations.

Establish ongoing maintenance and support procedures. This includes establishing a regular schedule for software updates and maintenance, as well as providing support to end-users who may experience issues or have questions about the software.

Conduct a post-implementation review to evaluate the effectiveness of the transition plan and identify areas for improvement.

By following this plan, you can ensure a successful transition of the skin disease prediction software from development to operations, and ensure that it is operating smoothly and effectively in its production environment.

CHAPTER 5

IMPLEMENTATION DETAILS

1. PREPROCESSING:

We had to address a few issues that cropped up throughout the data import process in order to get a decent performance of skin disease diagnosis and prediction. such as picture size and colour contrast. We have a module in our programme that deals with this issue. The Python image resizes programme automatically resizes each image before it is submitted to the server for processing. The major goal of this stage is to remove background sounds from the skin disease picture, such as hair, air bubbles, and other interruptions. The median filtering technique, mean, var, and histogram are utilised to reduce the noise in the specific skin picture and provide a smoother image.

Preprocess the collected data by resizing the images, normalising the pixel values, and converting them into a suitable format for the chosen machine learning framework.

2. FEATURE EXTRACTION:

We need a feature extraction technique that can operate on all of the layers of an image. As a result, the suggested system tries to incorporate additional algorithms, which forces us to use Convolutional neural networks .Convolutional neural networks (CNNs) are composed of several stacks that employ both linear and non-linear processes. These are CNN's three key pillars of support. The linked layer ReLU layer (non-linear Rectified Linear units), which is comparable to a typical multi-layer fully connected layer, comes after the pooling layer as the third layer.

Color is the primary feature that is extracted from the photos. The hue of the diseased area's infection aids in determining the disease's type. The YCbCr methodis used to extract the skin colour from a binary-formatted image.

Skin detection is influenced by each pixel's RGB colour ratio and pixels themselves. The YcbCr values may be produced using the RGB to YcbCr ratio for each pixel. alsoa part of a formula.

Y =

0.3R+0.29G+0.10BCr

=R – Y

Cb = B – Y

The true positive (TP) and true negative (TN) are validated based on the total numberof pixels, and the TP and TN are then calculated using the algorithm.

Precision: TP/ (TP+FP)

Accuracy: TP + TN/(TP+TN+FP+FN)

The second attribute that we got is the size of the affected area. The binary image is converted into a histogram, and the pixels of the histogram are then multiplied by the total area to calculate the overall area of infection.Our model estimated the size ofthe affected zone, which made it simpler for our classifier to predict the location of thedisease. We need to train our model using a feedforward back- propagation neural network in order to carry out our procedure.

The following are only a few of the countless feature extractions that were made from an image of one of the most prevalent illnesses, psoriasis: Correlation ranges from 1.7468 to 3.5963. Entropy ranges from 0.1902 to 0.5975. 2.9851 minimum, 3.4578 maximum homogeneity, contrast min: 8.821 max: 40.978 Energy is between 37.02 and 205.2763.

3. TESTING:

Testing is an essential step in skin disease prediction to evaluate the performance of the trained model and ensure that it can generalise well to unseen data. Here are some common testing methods used in skin disease prediction:

Hold-out testing: This method involves splitting the available data into training and testing sets. The model is trained on the training set, and its performance is evaluated on the testing set. This method is useful when you have a large dataset.

Cross-validation: This method involves dividing the data into multiple folds and training the model on each fold while using the remaining folds for testing. This method is useful when you have a small dataset and want to make the most of the available data.

External validation: This method involves testing the model on an external datasetthat was not used for training. This method is useful to ensure that the model can generalise well to unseen data and is not overfitting to the training data.

During testing, it's important to use appropriate metrics to evaluate the model's performance. Common metrics used in skin disease prediction include accuracy, precision, recall, and F1-score. It's also important to perform a visual inspection of the model's predictions and compare them with the ground truth to identify any patternsor biases in the model's predictions.

Overall, testing is a critical step in skin disease prediction to ensure that the trained model is accurate, reliable, and can be used for clinical decision-making.

CHAPTER 6

RESULTS:

Initially, we use an image processing technique by removing the backdrop in order to optimise the skin photos. The wounded component is therefore identified using the histogram, and the relevant cavities are used. Image intensities can be changed using the histogram equalisation approach to improve contrast. Contrast does not necessarily need to be increased all the time. Histogram equalisation may sometimes be detrimental in certain circumstances. In that situation, the contrast is reduced, allowing a diagram to be drawn to demonstrate which skin is diseased and which is not. as demonstrated in figure 6, distinguishes between various skin tones.

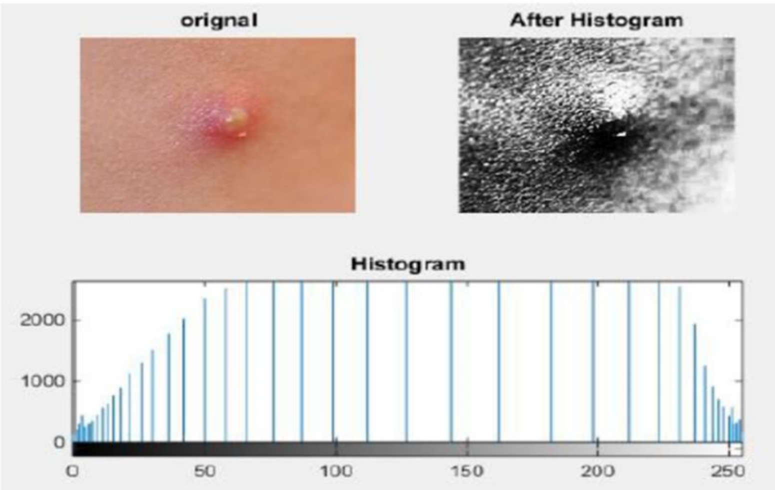


Figure 7 : Image Optimisation

CHAPTER 7

CONCLUSION

1. CONCLUSION:

Correct illness Skin diseases are less likely to spread thanks to diagnosis, which also makes it easier to spot skin abnormalities. This will give patients a practical and cost-effective therapy choice. Due to the ease with which the majority of skin conditions may be spread through contact, this would also aid in the early diagnosis and treatment of infections before they spread. We applied the SVM method and a customised pre-trained convolutional neural network model.

In conclusion, skin disease prediction is a challenging yet essential task that can improve the accuracy and efficiency of clinical diagnosis and treatment. With the increasing availability of large and diverse datasets of skin images and the advancements in machine learning algorithms and hardware, the field of skin diseaseprediction has made significant progress in recent years.

However, skin disease prediction is still an active area of research, and there are several challenges that need to be addressed. For example, the lack of diversity and quality in some skin image datasets can lead to biased and inaccurate predictions. Additionally, the interpretability and explainability of machine learning models in skin disease prediction are still a challenge, which can limit their adoption in clinicalsettings.

Despite these challenges, skin disease prediction has the potential to transform the way skin diseases are diagnosed and treated, and can help reduce the burden of skin diseases on individuals and society. It is crucial to continue research in this field to improve the accuracy, reliability, and interpretability of skin disease prediction models and ensure their safe and effective adoption in clinical settings.

2. RESEARCH ISSUES:

Skin disease prediction is a complex and challenging task that involves several research issues that need to be addressed to improve the accuracy and reliability of the prediction models. Here are some of the research issues in skin disease prediction:

Data Quality and Diversity: The quality and diversity of the skin image datasets used for training and testing the models play a critical role in the accuracy and generalisation of the models. There is a need for large and diverse datasets of skin images that can capture the variations in skin conditions across different populations, age groups, and skin types.

Interpretability and Explainability: The interpretability and explainability of the machine learning models used in skin disease prediction are still a challenge. It is crucial to develop models that can provide interpretable and transparent predictions, and enable clinicians to understand the reasoning behind the model's predictions.

Transfer Learning and Domain Adaptation: Transfer learning and domain adaptation techniques can improve the performance of skin disease prediction models by leveraging knowledge from related domains or datasets. However, there is a need for further research to investigate the effectiveness of these techniques in skin disease prediction and develop new methods that can better adapt to the specific characteristics of skin images.

Robustness and Fairness: Skin disease prediction models should be robust to variations in the input data and adversarial attacks, and should not exhibit bias or discrimination against specific populations or skin types. There is a need for further research to develop models that are robust and fair, and can ensure equitable healthcare access to all individuals.

Clinical Validation and Adoption: Skin disease prediction models should undergo rigorous clinical validation and testing before their adoption in clinical settings. There is a need for further research to investigate the clinical utility of these models, their impact on clinical decision-making and patient outcomes, and the ethical and legal implications of their adoption.

Overall, these research issues highlight the complexity and multidisciplinary nature of skin disease prediction and the need for collaboration between clinicians, dermatologists, machine learning experts, and data scientists to address these challenges and develop effective and reliable prediction models.

REFERENCES:

1. Archana Ajith1,Vrinda Goel1, Priyanka Vazirani1Dr. M. Mani Roj. (2017). “Digital dermatology”, International Conference on Intelligent Computing and Control Systems

2. P. B. Manoorkar Prof. D. K. Kamat Dr. P. M. Patil (2016). “Analysis and Classification of Human Skin Diseases “, International Conference on Automatic Control and Dynamic Optimization Techniques (ICACDOT)

3. Mayesha Sahir, Mim1 Monika Das, Md Adnan Kib (2018), “Feature Based Skin Disease Estimation Using Image Processing for Teledermatology” International Conference on Computer, Communication, Chemical, Material and Electronic Engineering

4. Tanvi Goswami , Vipul K. Dabhi , (2020). “ Skin Disease Classification from Image - A Survey”,International Conference on Advanced Computing & CommunicationSystems (ICACCS)

5. N Vikranth Kumar , P Vijeeth Kuma (2020)“Classification of Skin diseases using Image processing and SVM”, International Conference on Vision Towards Emerging Trends in Communication and Networking (ViTECoN)

6. Md. Nazrul Islam1,Jaime Gallardo-Alvarado2, Masyitah Abu1,Nurfazlyna Aneem Salman1 (2017) ,” Skin Disease Recognition Using Texture Analysis”, IEEE 8th Control and System Graduate Research Colloquium

7. Kyamelia Roy Sheli Sinha Chaudhuri Sanjana Ghosh (2019) , “Skin Disease detection based on different Segmentation Techniques”, International Conference on Opto-Electronics and Applied Optics (Optronix)

8. Sambit bakhshi (2019), “Deep convolutional neural network for face skin diseases identification”, 2019 Fifth International Conference on Advances in Biomedical Engineering (ICABME)

APPENDIX

A. SOURCE CODE:

App.py:

```
from flask import render_template, Flask,
requestfrom edge_app import pred_at_edge
import time
app   =   Flask(

name________)

SKIN_CLASSES = {

  0: 'akiec, Actinic Keratoses (Solar Keratoses) or intraepithelial Carcinoma
(Bowen’sdisease)',
  1: 'bcc, Basal Cell
  Carcinoma',2: 'bkl, Benign
  Keratosis',
  3: 'df, Dermatofibroma',
  4: 'mel, Melanoma',
  5: 'nv, Melanocytic Nevi',
  6: 'vasc, Vascular skin lesion'

}

@app.route('/'
)def index():
    return render_template('index.html', title='Home')

@app.route('/uploaded', methods = ['GET',
'POST'])def upload_file():
    start = time.time()
    if request.method == 'POST':
        skin_image = request.files['file']
        path='static/
        data/'+skin_image.filename
        skin_image.save(path)
        disease, accuracy=
    pred_at_edge(path)end = time.time()
    return render_template('uploaded.html', title='Success',
predictions=disease,acc=accuracy,
img_file=skin_image.filename,time_diff=end-start)

if__name_== "____
    main____":app.run()
```

Inference.py:

```
import os
import sys
import logging as log
from openvino.inference_engine import IENetwork,

IECoreclass Network:

    def__init__(self):
        self.plugin = None
        self.network = None
        self.input_blob = None
        self.output_blob = None
        self.exec_network =
        Noneself.infer_request =
        None

    def load_model(self, model, device="CPU",

        cpu_extension=None):model_xml = model

        model_bin = os.path.splitext(model_xml)[0] + ".bin"

        # Initialize the plugin
        self.plugin = IECore()

        # Add a CPU extension, if applicable
        if cpu_extension and "CPU" in device:
            self.plugin.add_extension(cpu_extension, device)

        # Read the IR as a IENetwork
        self.network = IENetwork(model=model_xml, weights=model_bin)

        # Load the IENetwork into the plugin
        self.exec_network = self.plugin.load_network(self.network, device)

        # Get the input layer
        self.input_blob = next(iter(self.network.inputs))
        self.output_blob = next(iter(self.network.outputs))

        return


    def get_input_shape(self):

        #Gets the input shape of the network

        return self.network.inputs[self.input_blob].shape
```

```
def async_inference(self, image):
   #Makes an asynchronous inference request, given an input

   image.self.exec_network.start_async(request_id=0,

      inputs={self.input_blob:
   image})return


def wait(self):
   #Checks the status of the inference request.

   status =
   self.exec_network.requests[0].wait(-1)return
   status


def extract_output(self):
   #Returns a list of the results for the output layer of the

   network.return

   self.exec_network.requests[0].outputs[self.output_blob]
```

Edge_app.py:

```
import cv2
import numpy as np
from inference import Network

#cpu extension path
CPU_EXTENSION = "/opt/intel/openvino/deployment_tools/inference_engine/lib/
intel64/libcpu_extension_sse4.so"

#path of converted skin disease model in
xmlMODEL = "model/model_tf.xml"

SKIN_CLASSES = {
  0: 'akiec, Actinic Keratoses (Solar Keratoses) or intraepithelial Carcinoma
(Bowen’sdisease)',
  1: 'bcc, Basal Cell
  Carcinoma',2: 'bkl, Benign
  Keratosis',
  3: 'df, Dermatofibroma',
  4: 'mel, Melanoma',
  5: 'nv, Melanocytic Nevi',
  6: 'vasc, Vascular skin lesion'

}

def preprocessing(input_image, height,

    width):image = np.copy(input_image)

    image = cv2.resize(image, (width,
    height))image = image.transpose((2,0,1))
    image = image.reshape(1, 3, height,

    width)return image


def pred_at_edge(input_img):

    # Initialize the Inference
    Engineplugin = Network()

    # Load the network model into the IE
    plugin.load_model(MODEL, "CPU",
    CPU_EXTENSION)net_input_shape =
    plugin.get_input_shape()
    # Reading input image
    img = cv2.imread(input_img, cv2.IMREAD_COLOR)

    # Pre-process the image
    expand_img = preprocessing(img, net_input_shape[2],
    net_input_shape[3])final_img=np.expand_dims(expand_img, axis=0)
```

```
# Perform inference on the
image
plugin.async_inference(final_img)
# Get the output of inferenceif
plugin.wait() == 0:
    results = plugin.extract_output()
    pred=np.argmax(results) disease
    = SKIN_CLASSES[pred]
    accuracy = results[0][pred]
    print(disease, accuracy)
    return disease, accuracy
```

B. SCREENSHOTS:

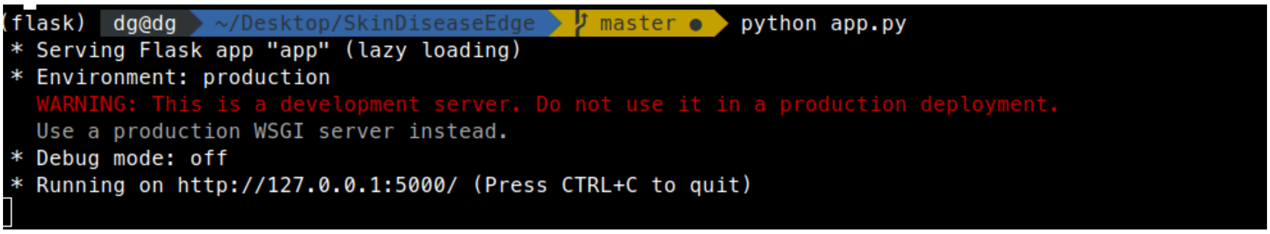


Fig 8: App_link

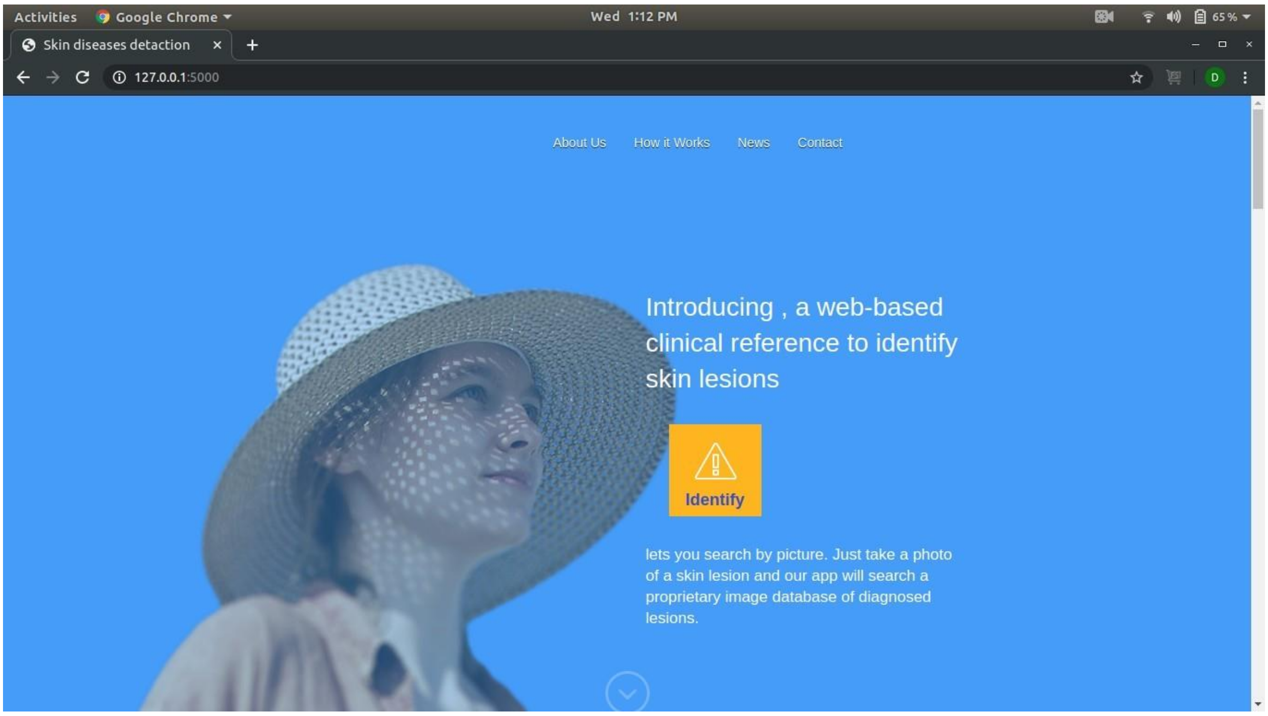


Fig 9:Home page

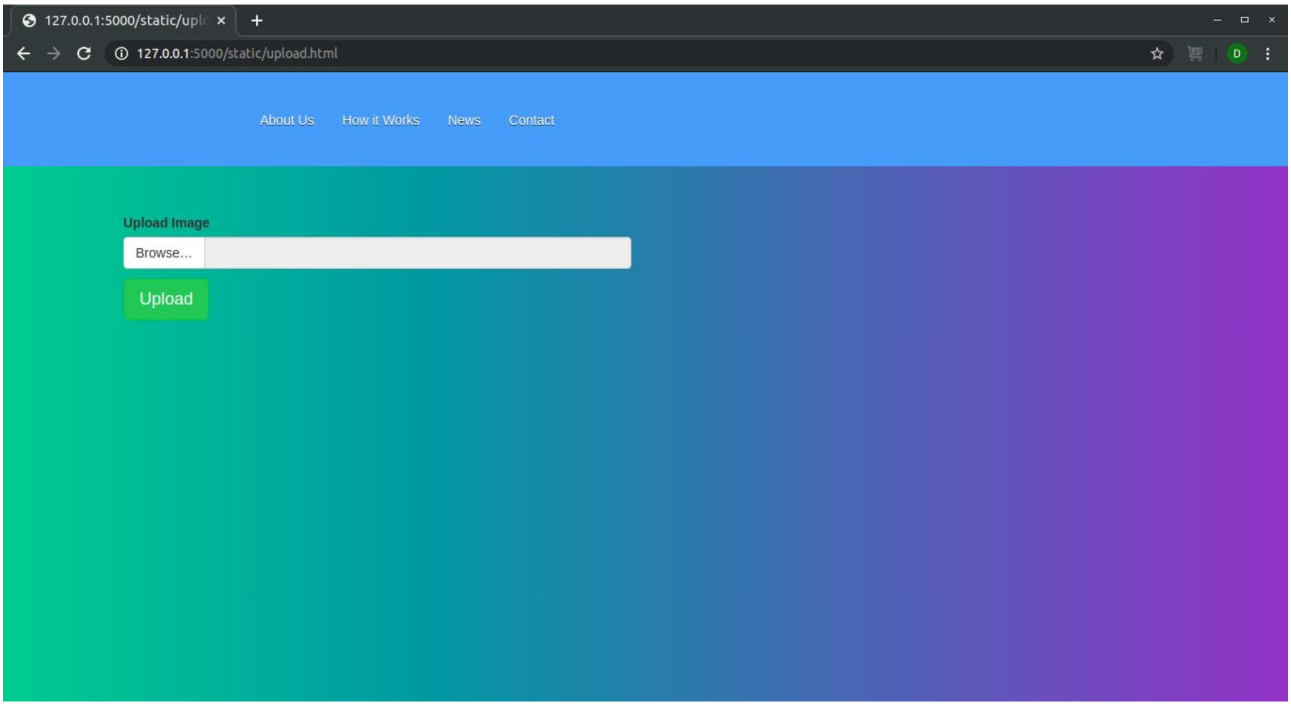


Fig 10:Upload Image

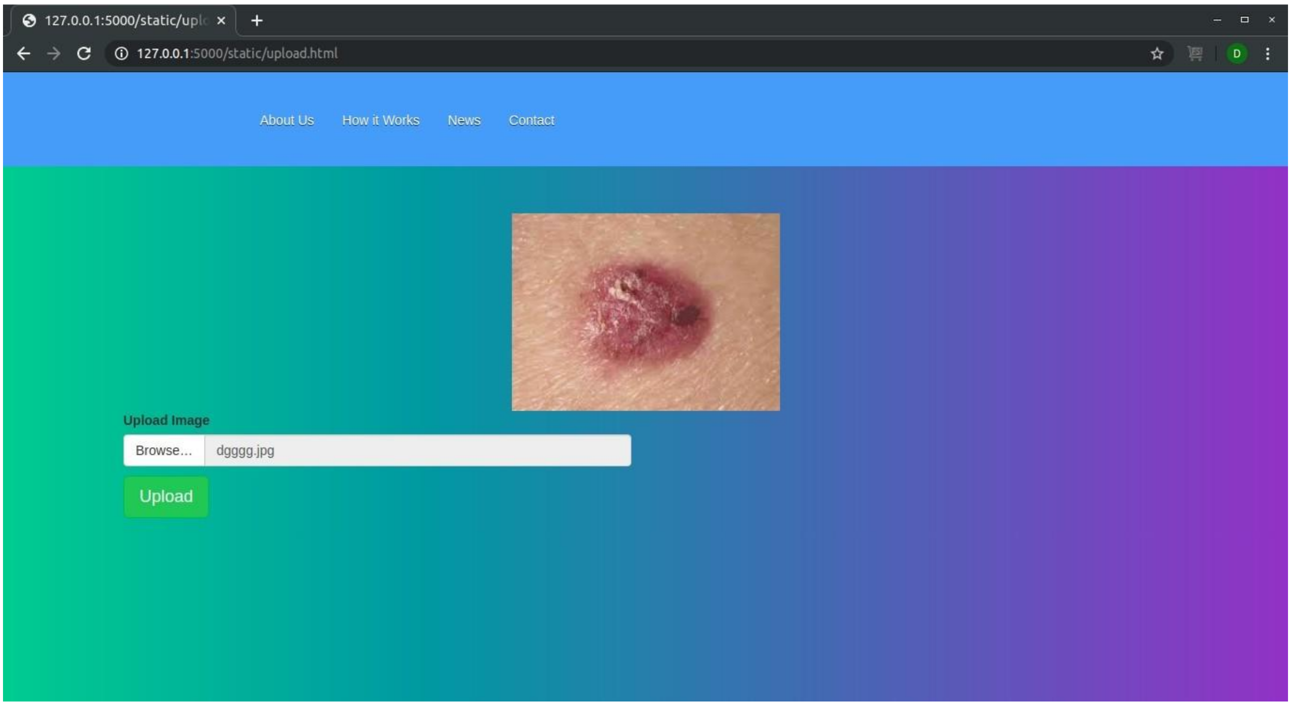


Fig 11:Uploaded_image

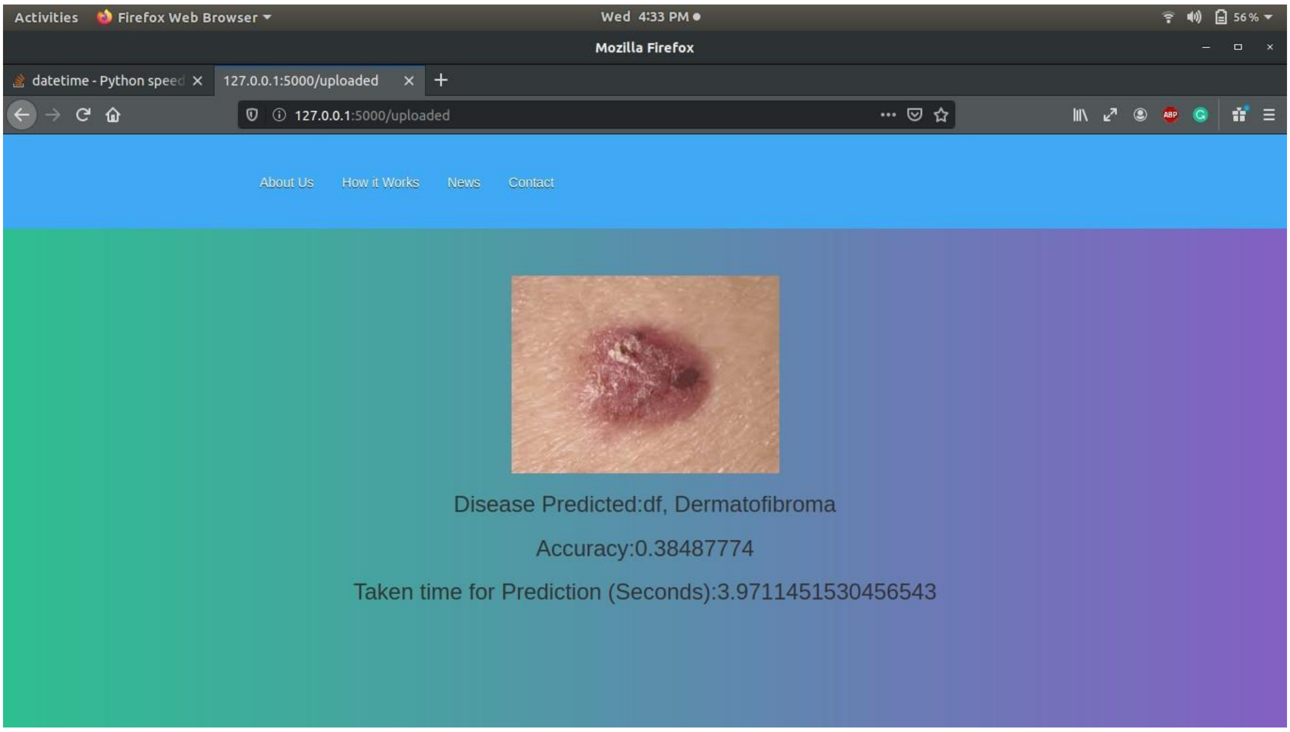


Fig 12: Skin disease prediction

C. RESEARCH PAPER:

Research Article

Skin Disease Prediction using Machine Learning

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Abstract. — A amazing organ in the human body is the skin. It regularly experienced both common and rare illnesses. The most challenging and complicated area of research is therefore the identification of human skin diseases. Due to inadequate infrastructure and support for the medical industry, the vast majority of occurrences go unreported. This essay aims to address this conundrum. In order to create an Android mobile application, this research effectively suggests the (CNN-SVM-MAA) system, which combines a convolutional neural network with a support vector machine classifier. Many tests are conducted on our dataset to determine the effectiveness of the suggested technique. An estimated 3000 images were gathered from various websites and sources to increase the accuracy and realism of this collection. Different feature extraction techniques were used in comparative research using different classifiers. The success of the proposed (CNN-SVM - MAA) system was demonstrated by the number of skin sickness photographs identified fromthe skin disease dataset. It made it possible for the user to get details on their skin condition, including the name of the illness and a recommendation for the best course of action.

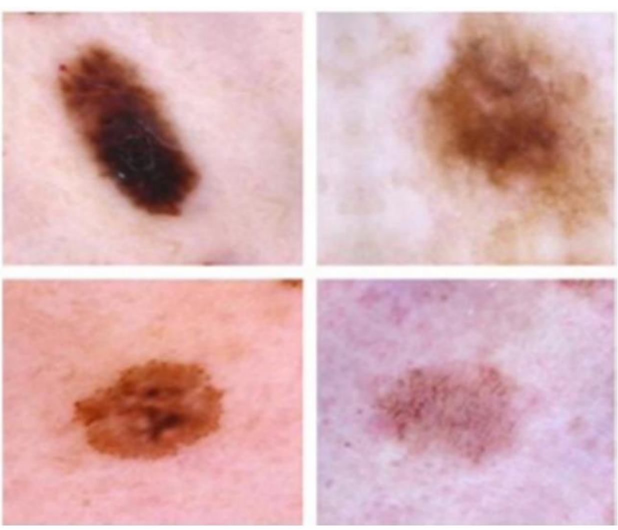
1. Introduction

Almost all ages of people are affected by skin disorders. The prevalence of skin diseaseshas increased as a result of changing environments and lifestyles. According to statistics, one in five Americans has some sort of skin issue. Numerous organismal cells, a variety of foods, and both internal and external factors like the hierarchical genetic group of cells, hormones, and environmental conditions are frequently responsible for their onset. These elements may operate alone or in concert to cause skin issues. Eczema and psoriasis are a couple of examples of persistent, debilitating illnesses. One instance of a malignant disease is malignant melanoma. According to recent studies, many illnesses can be treated if they are caught early enough.

A review of the literature revealed that a professional application of skin disease detection using techniques like Naive Bayes, CNN, and SVM approaches must bedeveloped in order to assist everyone who wants to learn about skin diseases that are being experienced or needs knowledge about skin diseases. The body of literature that details how to identify these conditions using image processing has been significantly improved by numerous academics. This has made our application possible and shown us the best course of action. It would never have been simpler for me to design any application without the earlier work of these science colleagues. It can be difficult to identify skin problems early on, and it can be even harder to classify them independently. Melanoma is the most serious type of skin cancer because it has the most potential to spread to other parts of the body even with early detection and treatment. Using the machine learning algorithm Support Vector Machine, specific skin disorders can be classified (SVM).

One of the more common issues in image processing is image categorization. Support Vector Machine is a form of machine learning method used to analyse text and image data that is both organised and unstructured. It belongs to the group of models for supervised learning. SVM always needs clean data as an input. The challenge in identifying skin diseases is classifying the images into the various categories of skin conditions. This study provides a thorough review of machine learning and image processing techniques used in the design of Android applications that can identify skin illnesses.

The study makes use of a dataset of skin conditions. According to a review of the literature, Convolutional Neural Network (CNN) and Support Vector Machines (SVM) are the best algorithms for spotting skin conditions. The ratio of input diseases to detected diseases is calculated for each category of skin disease as part of the results. These are few illustrations of various skin problems.



Skin Disease images sample

To identify various disorders in these works, we employed machine learning techniques and OpenCV's image processing features. To find these diseases, we used statistical analysis, CNN, and SVM. The suggested application combines detection with advice onhow to proceed with medical care.

More than 2500 images of various skin conditions from Derma net were used to train our model. To build a test model, we used about 700 identical photos from the same source. Globally, 2 billion Android smartphones—or roughly one-third of the population —are in use. As a result, it is the programme that is most user-friendly. A dermatologist can also occasionally have trouble spotting a disease in its early stages. By using our programme, he can at least gain a general understanding of the potential illness. The application also offers a dashboard so the doctor can manage patients remotely and perhaps even identify a patient's illness. The technical aspect of our research provides insight into how we identify skin diseases.

The paper is organised as follows: The literature review in Section II includes a summary of the ongoing research projects and suggested algorithms. The methods covered in Section III are used to produce the block diagram, research question, and problem definition. The investigation is concluded in Section VI. Section IV shows screenshots and different phases of the creation of an Android application.

2. Literature Review

As we mentioned earlier, there are several papers which are proposed on image-processing based detection of skin diseases. We have reviewed the various techniques mentioned in the literature.

In [1] Arifin, S., Kibria, Firoza, A. Amini & Yan H at el. "Dermatologist Disease Diagnosis using color-skin images", has proposed a two-stage method to detect the disease based on color texture- based identification and by using a classification to identify the name of the disease. The first stage has the accuracy of 95.99% and the second stage has 94.016% accuracy.

In [2] Nawal Soliman, & ALKolifi AlEnezi at el. "A method of skin disease detection using Image Processing and machine learning" has proposed early detection method on image processing based on Convolutional neural network to feature extraction and then using color to identify the features.

In [3] Pravin S. Ambad & A. S. Shirsat at el. "An image analysis System to detect skin diseases" has proposed a system for early identification of skin problem using statistical

analysis and ad boost classifier. Their research mainly focused on early identification of skin cancer symptoms based on statistical analysis with correlation algorithms.

In [4] Li-sheng Wei, Quan Gan, and Tao ji at el. "Skin Disease recognition method based on image color and texture features" has proposed a model based on feature extraction of image using color texture and using segmentation and SVM on it to identify the disease.

In [5] R. Yasir, M S I Nibir and N. Ahmed at el. "A skin disease detection system for financially unstable people in developing countries" has proposed a system for detectionof disease which could be implemented on mobile devices as well as computer using desktop application based upon computer vision technique.

In [6] R Sumithra, M Suhilb and D S guruc at el., "Segmentation and classification of skin lesion for disease diagnosis" has proposed a model for segmentation and classification a skin disease using SVM and KNN algorithms.

In [7] Rahat Yasir, Md. Ashiqur Rahman and Nova Ahmed at el. "Dermatological Disease detection using image processing and artificial neural network" has used various kind of different image processing algorithms for feature extraction and feed forwarding using artificial neural network for training and testing the model. The system works on two parts, in the first part the feature extraction has been taken place based upon the color texture and in the second stage the classifier identifies the possible disease.

In [8] Nidhai k, Al Abbadi, Nizzar Saadi at el., "Psoriasis detection using skin color and texture features" has proposed a model for identification of psoriasis using color feature extraction and classification of the skin image.

In [9] Kumar, V., Kumar S., & Saboo, V. at el, "Dermatological disease detection using Image Processing and machine learning" has proposed a model which uses computer vision and machine learning. The features of image are extracted and algorithms are applied ontoit to detect six types of diseases with a accuracy of 95%.

In [10] Pollap D. et al. "An intelligent for monitoring skin disease" has proposed a method of clustering image using navi for classification. They have used SIFT method for detection of key points in the image. After that they have used CNN and SVM for classification and segmentation. They have a accuracy of 84% and a precision of 82%.

In [12] Abbadi et al."Psoriasis detection using skin color and texture feature" has mentioned color feature extraction method and texture extraction method to detect psoriasis on skin. Color feature are extracted by using own mathematical formula for RGB color. Also, various other texture features are extracted by using various components such as entropy, energy, contract and homogeneity of the image.

In [13] Megha D. Tijare et al. "Detecting skin disease by accurate skin segmentation using various color spaces" has presented a survey paper on how various skin segmentation techniques are helping in detecting of the skin disease. Also mentioned the various steps which are used alongside the detection of these diseases.

In [14] Ekta Singhal et al. Skin cancer detection using Artificial Neural Network has used Segmentation, Feature Extraction and Classification technique to get the result. Segmentation is done using Thresholding, then features are extracted using 2-D wavelet decomposition. And then classification is done using back propagation neural network and radial basic neural network.

In [15] Manish Kumar and Rajiv Kumar et al. an intelligent System to diagnose the skin disease has proposed formulas for image segmentation and then feature extraction of the image. For feature Extraction various parameters are calculated such as mean, Variance, Energy and Entropy from the image.

In [16] Shashi Rekha at al. Digital Dermatology- Skin disease detection model using image processing has proposed a model for detection of six different skin diseases and skin conditions based on method of feature extraction and classification of the image.

In [17], VR Balaji et. al. - Skin disease detection and segmentation using dynamic graph cut algorithm and classification through Naive Bayes classifier, graph cut algorithms are used for image processing of skin images and naïve Bayes algorithmused as a classification algorithm.

In [18], Nawal Soliman et. al. - A Method of Skin Disease Detection Using Image Processing and Machine Learning, used image processing techniques and CNN and SVM algorithm as machine learning algorithms.

In [19] Sumitra Ra. Et al. segmentation and classification of skin lesions for disease diagnosis has proposed a method for detection of disease by using the combination of SVMand KNN algorithms. Used segmentation and classification methodology to get theaccuracy of F-measure 61%.

In [20] Menzis et al. Frequency and morphologic characteristics of invasive melanomas lacking specific surface microscopic features has proposed SVM classifier-based model for identification of melanomas. They used color feature and texture featureextraction to get a sensitivity result 96 % and specificity of 75%.

The conclusions that may be derived from the literature review are as follows.

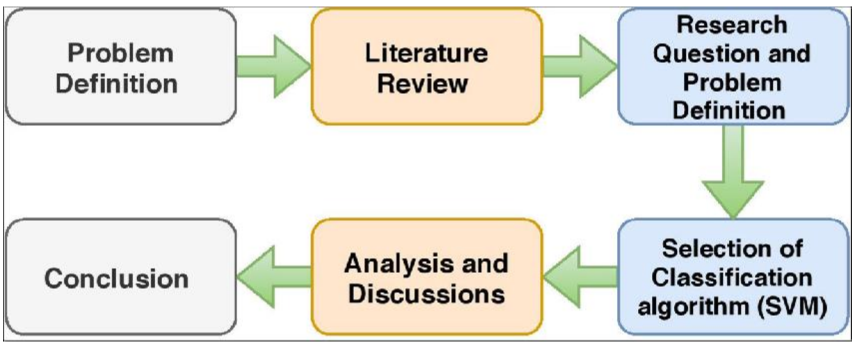
- Most commonly, the support vector machine is utilised for skin disease detection andprediction.
- SVM has an accuracy range of 80–90%, depending on the dataset.
- The UCI machine repository contains a dataset on skin illnesses that includes hundreds ofphotos for different skin conditions.
- Analysis of the data is done using criteria including accuracy, F measure, specificity, and entropy.

3. Methodology

Research work flow:

The following describes the research's recommended methodology:

- The topic is presented as a research challenge together with a list of pertinent reviews of the literature, the intended sector (such as the requirement to address the issue of skin disease), and the current topic.
- On the Scopes and Web of Science platforms, we examined 30 research that dealt with the prognosis of skin conditions. Ten publications were taken out of the review analysis because we didn't think they accurately reflected the integrity of the study.
- A review of the literature led us to the conclusion that Support Vector Machine algorithm is widely utilised when using machine learning to classify skin diseases.
- The SVM algorithm is chosen as a classification approach based on the suggestions from the literature review. Using SVM, we came up with the issueand the study questions.
- The SVM was used on a dataset of skin conditions, and the results are displayed. The appropriate inference is made.



Flow of the Research Work Proposed

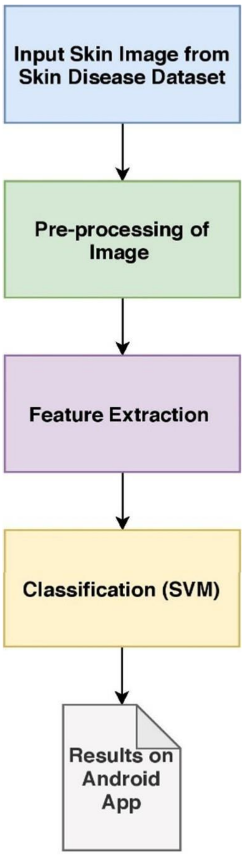
3.1. Dataset Description

We have gathered over 2500 photographs from various websites that are devoted to skin illnesses and their treatment in order to increase the accuracy and realism of our collection. The training set and test sets were created using the data. Our model is developed using data from the training set, and its effectiveness is evaluated using data from the test set. Then, multiple classifications are used to segregate the diseases that will be found for each subset of our dataset. Only illnesses that have become increasingly prevalent over the world have been added. But, future versions will providea lot more expanding illness therapies. The disease dataset is fully described in the table that follows.

Skin Disease Dataset

Disease	Sample Images	No. of Images
Psoriasis		500
Melanoma		200
Eczema		250
Acne		350
Corn		150

Classification steps:



SVM classification algorithm flowchart

The workflow of the SVM classification algorithm is shown in the diagram above. The Skin Disease Dataset is used to get the input skin image. It is referred to as the image acquisition phase in Android applications. The picture was grabbed from the Android app's image gallery. The pre-processing entails adjustments to the brightness, contrast, and exact image size. We require a feature extraction method that can work on every layer of a picture. We apply the CNN and SVM technique as a result of this requirement. The outcomes are shown by the Android software itself.

Preprocessing:

We had to address a few issues that cropped up throughout the data import process in order to get a decent performance of skin disease diagnosis and prediction. such as picture size and colour contrast. We have a module in our programme that deals withthis issue. The Python image resizer programme automatically resizes each image before it is submitted to the server for processing. The major goal of this stage is to remove background sounds from the skin disease picture, such as hair, air bubbles, and other interruptions. The median filtering technique, mean, var, and histogram are utilised to reduce the noise in the specific skin picture and provide a smoother image.

Feature Extraction:

We need a feature extraction technique that can operate on all of the layers of an image. As a result, the suggested system tries to incorporate additional algorithms, which forces us to use Convolutional Neural Network.Convolutional neural networks (CNNs) are composed of several stacks that employ both linear and non-linear processes. These are CNN's three key pillars of support. The linked layer ReLU layer (non-linear Rectified Linear units), which is comparable toa typical multi-layer fully connected layer, comes after the pooling layer as the third layer.

Color is the primary feature that is extracted from the photos. The hue of the diseased area's infection aids in determining the disease's type. The YCbCr method is used to extract the skin colour from a binary-formatted image.

Skin detection is influenced by each pixel's RGB colour ratio and pixels themselves.The YcbCr values may be produced using the RGB to YcbCr ratio for each pixel. also a part of a formula. Y = 0.3R+0.29G+0.10B

$$\mathbf{Cr = R - Y}$$

$$\mathbf{Cb = B - Y}$$

The true positive (TP) and true negative (TN) are validated based on the total numberof pixels, and the TP and TN are then calculated using the algorithm.

Precision: TP/ (TP+FP)

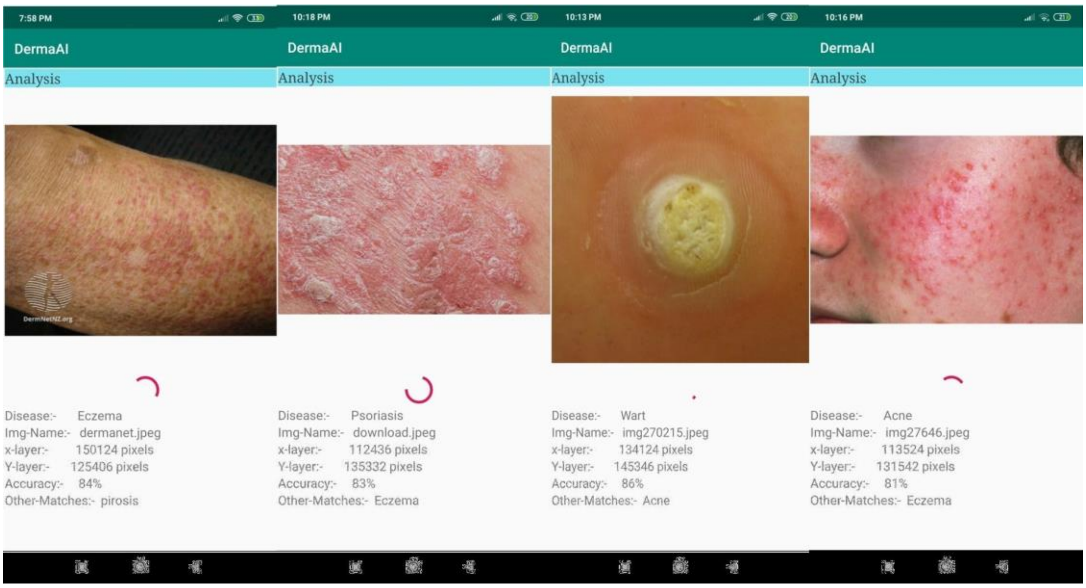
Accuracy: TP+ TN/(TP+TN+FP+FN)

The second attribute that we got is the size of the affected area. The binary image is converted into a histogram, and the pixels of the histogram are then multiplied by the total area to calculate the overall area of infection.Our model estimated the size of the affected zone, which made it simpler for our classifier to predict the location of the disease. We need to train our model using a feedforward back- propagation neural network in order to carry out our procedure.

The following are only a few of the countless feature extractions that were madefrom an image of one of the most prevalent illnesses, psoriasis: Correlation ranges from 1.7468 to 3.5963. Entropy ranges from 0.1902 to 0.5975. 2.9851 minimum, 3.4578 maximum homogeneity, contrast min: 8.821 max: 40.978 Energy is between 37.02 and 205.2763.

Classification:

A statistical analysis technique built on statistical theory is support vector machine. The various ailments can best be categorised in this way. The training data given into the SVM algorithm aids in illness diagnosis. Using practise datasets, feature extractionis performed . In this case, the illness is identified using a prebuilt model.



Analysis and Identification of Eczema, Psoriasis, Warts, and Acne

5. Results

We first use an image processing technique that removes the backdrop in order to optimise the skin photos. The damaged component is located using the histogram, and the corresponding cavities are then used. With the histogram equalisation method, image intensities can be changed to improve contrast. The difference does not necessarily need to be more stark. Depending on the circumstance, histogram equalisation may occasionally be detrimental. In that situation, the contrast is diminished, enabling the creation of a diagram that distinguishes between diseased and uninfected skin. as shownin figure 6, distinguishes between various skin tones.

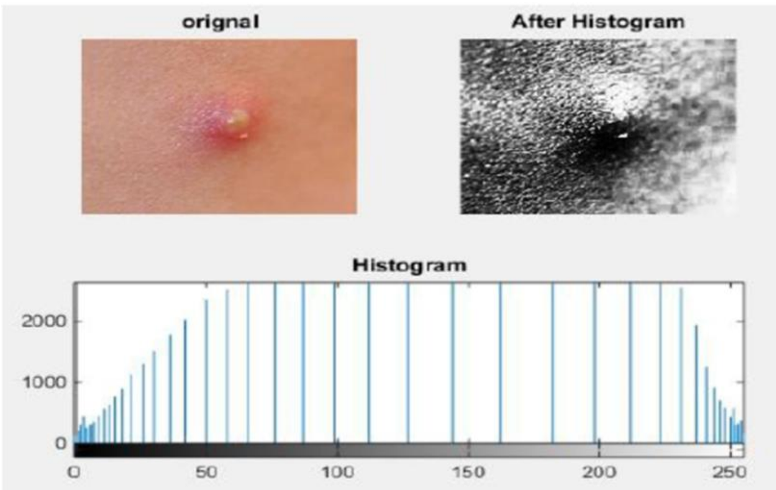


Image Optimisation

6. Conclusion

Correct illness Skin diseases are less likely to spread thanks to diagnosis, which also makes it easier to spot skin abnormalities. This will give patients a practical and cost-effective therapy choice. Due to the ease with which the majority of skin conditions maybe spread through contact, this would also aid in the early diagnosis and treatment of infections before they spread. We applied the SVM method and a customised pre-trained convolutional neural network model.

References

1. Arifin, S., Kibria, G., Firoze, A., Amini, A., & Yan, H. (2012) “Dermatological Disease Diagnosis Using Color-Skin Images.” Xian: International Conference on Machine Learning and Cybernetics. W.-K. Chen, Linear Networks and Systems (Book style). Belmont, CA: Wadsworth, 1993, pp. 123–135.
2. Nawal Soliman ALKolifi ALEnezi “A method of skin disease detection using image processing and machine learning” at 16TH International learning & Technology conference 2019
3. Pravin S. Ambed, A S Shirsat “A image analysis system to detect skin diseases” at IOSR Journal of VLSI and signal processing Volume 6 Issue 5 Ver 1 e-ISSN 2013-4200
4. Li-Sheng Wei, Quan Gan and Tao ji “Skin Disease Recognition Method Based on Image Color and texture features”Y. Computational and Mathematical Methods in Medicine Volume 2018, Article ID 8145713, 10 pages https://doi.org/ 10.1155/2018/8145713
5. R. Sumithra, M. Suhilb, and D. S. Guruc, “Segmentation and classification of skin lesions for disease diagnosis,” Procedia Computer Science, vol. 45, pp. 76–85, 2015.
6. Rahat Yasir, Md Ashiqur rehman and Nova Ahmed “Dermatological Disease Detection using image processing and Artificial Neural Network” 8th International Conference on Electrical and Computer Engineering 20-22 December, 2014, Dhaka, Bangladesh
7. R. Yasir, M. S. I. Nibir, and N. Ahmed, “A skin disease detection system for financially unstable people in developing countries,” Global Science and Technology Journal, vol. 3, no. 1, pp. 77–93, 2015.
8. Kumar, V., Kumar, S., & Saboo, V. (2016) “Dermatological Disease Detection UsingImage Processing and Machine Learning.” IEEE.
9. S. Kumar and A. Singh, “Image processing for recognition of skin diseases,” International Journal of Computer Applications, vol. 149, no. 3, pp. 37–40, 2016.
10. Dawid Połap,* Alicja Winnicka, Kalina Serwata, Karolina Kęsik, and Marcin Woźniak et al. An Intelligent System for Monitoring Skin diseases. Published online 4August 2018, DOI: 10.3390/s18082552
11. Z. Hu and C. S. Yu, “Functional research and development of skin barrier”, Chinese Journal of clinicians, vol. 7, no. 7, pp. 3101-3103,2013
12. Nidhal K. Al Abbadi, Nizar Saadi Dahir, Muhsin A. AL-Dhalimi and Hind Restom, "Psoriasis Detection Using Skin Colour and Texture Features", Journalof Computer Science 6 (6): 626- 630, 2010, ISSN 1549-3636, © 2010 Science Publications
13. Megha D. Tijare, Dr. V. T. Gaikwad at el. “Detecting skin disease by accurate skin segmentation using various color spaces” Published 2018 in Journal of Engineering Research and application.
14. Ekta Singhal, Skin Cancer Detection using Artificial Neural Network, International Journal of Advanced Research in Computer Science Volume 6, No. 1, Jan-Feb 2015.
15. Manish Kumar and Rajiv Kumar, An intelligent system to diagnosis the skin disease,ARPN Journal of Engineering and Applied Sciences VOL. 11, NO. 19, OCTOBER 2016 ISSN 1819-6608.

16. Shashi Rekha G, Prof. H. Srinivasa Murthy, Dr. Suderson Jena et al. “Digital Dermatology – skin Disease Detection Model Using Image Processing. Published in International Journal of Innovative Research in Science, Engineering and Technology. Vol 7, Issue 7, July 2018.

17. Balaji, V. R., Suganthi, S. T., Rajadevi, R., Kumar, V. K., Balaji, B. S., & Pandiyan, S. (2020). Skin disease detection and segmentation using dynamic graph cut algorithm and classification through Naive Bayes Classifier. Measurement, 107922.

18. ALEnezi, N. S. A. (2019). A Method Of Skin Disease Detection Using Image ProcessingAnd Machine Learning. Procedia Computer Science, 163, 85-92.

19. Sumithra Ra, Mohammad Suhilb, D.S.Guruc, Segmentation and Classification of Skin Lesions for Disease Diagnosis, (ICACTA-2015) International Conference onAdvanced Computing Technologies andApplications

20. S. Menzies, C. Ingvar, K. Crotty and W. McCarthy. 1996. Frequency and morphologic characteristics of invasive melanomas lacking specific surface microscopic features.Arch. Dermatol. 132(10): 1178- 1182.