International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 04 | Apr 2021 www.irjet.net p-ISSN: 2395-0072

SKIN DISEASE DETECTION USING DEEP LEARNING

Sruthi Chintalapudi[1], Vikas Prateek Mishra[2], Shubham Sharma[3], Sunil Kumar[4]

[1-3]B.Tech Final Year, Computer Science Engineering, Sharda University, Greater Noida, India
[4]Professor, Dept. of Computer Science Engineering, Sharda University, Greater Noida, India

---

Abstract - *The image categorization is a classical problem of image processing, computer vision, and machine learning fields. In this paper, we will see the image classification using deep learning. This paper gives a way to deal with utilize different PC vision-based strategies (profound figuring out how) to naturally anticipate the different sorts of skin infections. In the developed application, the user will be provided with a portal where they can upload images and they will be checked for most common skin diseases (including STDs) by an algorithm developed using deep learning by training it with a vast variety of images. This technique takes the digital image of disease as input of affected skin area, then uses image analysis to identify the type of disease. This methodology thinks of basic, quick, and doesn't need costly hardware other than a camera and a computer. The methodology works on the inputs of a color image. At that point resize the picture to extricate highlights utilizing convolutional neural organization. Finally, the outcomes appear to the client, including the sort of sickness, spread, and seriousness*

***Key Words*: Convolutional Neural Networks; Deep Learning; Image Classification; Machine Learning.**

1. INTRODUCTION

The most unknown and complex section of science i.e. Dermatology remains complicated because of its procedures involved in the diagnosis of diseases related to hair, skin, nails. The difference in these diseases is often seen due to many environmental, geographical factor variations. In the Human Being, Human skin is taken into account the most uncertain and bothersome terrains due to the existence of hair, its deviations in tone, and other mitigating factors. In the process of skin disease detection, it includes series of pathological laboratory tests for the identification of the correct disease. For the last so many years these diseases are a matter of concern as their sudden arrival and their complexities have increased the life risks. These Skin abnormalities are very infectious and should be treated at primary stages to avoid them from spreading. Most of these skin irregularities are very fatal, particularly if not treated at a primary stage. The Human mindset tends to assume that the majority of skin abnormalities don't seem to be as dangerous as described thereby applying their curing methods. However, if these remedies are not treated immediately for that selective skin problem then it makes it even dangerous. The available diagnosis procedure consists of long laboratory procedures but this approach proposes a system that will help people to predict skin disease using computer vision. In common, most general people do not know the type and stage of skin disease. Some of the pores and skin sicknesses display signs numerous months later, inflicting the ailment to increase and develop further. This is due to the lack of medical knowledge in the public. Sometimes, a dermatologist (skin specialist doctor) may also find it difficult to diagnose the skin disease and may require expensive laboratory tests to correctly detect the type and stage of the skin disease. The advancement of medical technology has made it possible to diagnose skin diseases much more quickly, efficiently, and accurately with lasers and photonics. However, the cost of such a diagnosis is still limited and very expensive. Therefore, we come up with an image processing-based approach using deep learning to diagnose skin diseases. This method takes the digital image of the disease affecting the skin area as input and then uses image scanning to identify the type of disease. This approach is simple, fast and, does not require expensive equipment other than a camera and a computer.

2. LITERATURE SURVEY

Deep Learning (DL) is that part of Artificial Intelligence (AI) where a computer algorithm calculation investigations crude information and consequently learns different highlights required for recognizing concealed patterns in them. In the course of recent years, this field has seen striking progression in the capacity of Deep Learning-based calculations to dissect different sorts of information, particularly pictures and regular language. Medical care and medicine have been incredibly profited by ongoing advances in picture characterization and item recognition, in a general sense those clinical controls where conclusions are founded on the identification of morphologic changes, for example, pathology, radiology, ophthalmology and dermatology, and so forth In such clinical fields, computerized pictures are caught and given to DL calculations to Computer-Aided Diagnosis (CAD). These development calculations have just made their imprint and got fruitful on robotized identification of diseases like tuberculosis, bosom harm, glaucoma, diabetic retinopathy and, genuine mind discoveries, for example, stroke, discharge, and mass impacts. Wide-scale manual screening for infections is thoroughly relentless, incredibly extended, and seriously vulnerable to human inclination and exhaustion. Since manual finding may likewise be influenced by physicians due to their degree of

involvement and diverse dermoscopic calculations in which they are officially prepared, different specialists may differ on their determination for a specific condition. Moreover, because of doctors' abstract decisions, the manual finding is not reproducible. Then again, CAD can give quick, dependable and, normalized findings of different infections with more consistency, efficiency and, precision. Computer-aided design can likewise offer the chance of productive and practical screening and anticipation of cutting-edge tumor infections to individuals living in provincial or far-off regions where master dermatologists are not effectively accessible. A large portion of openly accessible datasets for clinical or dermoscopic pictures like Interactive Atlas of Dermoscopy, Dermofit Image Library, Global Skin Atlas, MED-NODE and PH2] and so forth contain simply two or three hundred to several thousand pictures. Ali et al. guaranteed that around 76% of the investigations they reviewed utilized datasets more modest than 1000 pictures and they broke down the biggest dataset utilize 2430 pictures. Henceforth, the majority of existing deals with CAD of skin sicknesses location utilize either private or tiny openly accessible datasets. Also, these investigations normally show a huge spotlight on just double or ternary arrangement of skin illnesses and, very little consideration is paid to multi-class characterization to investigate the maximum capacity of DL. Hence, such examinations act just as a proof-of-idea for the adequacy of AI in dermatology. In this work, we expand past works by demonstrating that the DL approach is fairly fit for perceiving several skin sores, and consequently should be promoted to their full degree.

The skin infection determination incorporates a progression of obsessive lab tests for the ID of the right sickness. These Skin irregularities are extremely irresistible and should be treated at before stages to evade them from spreading. . A large number of these skin variations from the norm are deadly especially if not treated at an underlying stage. Human attitude will in general assume that most skin anomalies are not as lethal as portrayed in this way applying their restoring techniques. Nonetheless, on the off chance that these cures are not adept for that specific skin issue, at that point it aggravates it even. The accessible finding technique comprises of long research center methodology however this venture proposes a framework that will empower clients to foresee the skin sickness utilizing computer vision.

3. PROPOSED SYSTEM

The objective is to create a portal to receive images and run it by an algorithm to identify the type of skin disease. The First step is collecting a large number of images(10,000+) for different types of skin diseases. After that research into the medical field to study these images and based on that developing and fine-tuning the algorithm to produce more and more accuracy. Developing a user-friendly portal where the user can upload images and get the result after processing.

4. FEASIBILITY STUDY

Framework venture practicality can be evaluated in three headways:

- Economically
- Technically
- Operationally

4.1 Economic feasibility

The expense of Software and Hardware needed for the framework including the capacity of information has been assessed. The result of which tells us that this project is extremely economically feasible as apart from the technical knowledge required, this project does not require any costly software or hardware resources to be developed. It can be developed using freely available open-source software (like Jupyter) on any basic modern personal computer. Once the project is developed, it does not need any additional cost for its application.

4.2 Technical feasibility

This project is technically feasible as it will employ Supervised learning for classification and labeling. This method has been employed several times to identify different things based on the images. So, we can expect it to be able to identify the type of skin disease based on the photograph supplied. There have been few projects and studies in this field that we're able to achieve up to 75% accuracy. We want to go beyond it by being able to add symptoms for enhanced accuracy. This is believed to be technically feasible as in other such multidisciplinary projects of machine learning and the medical field, it was possible to improve the accuracy of the prediction model by supplying symptoms faced by patients.

4.3 Operational feasibility

Operational achievability is reliant on the clients who will utilize the product once it's prepared for use. The product will have an easy to understand interface which will be exceptionally advantageous as they will simply need to open the online application, upload a clear image of the affected area and give the symptoms in the format of a web form and they will get the result and suggestions(if any). Thus, the project is operationally feasible.

5. METHODOLOGY

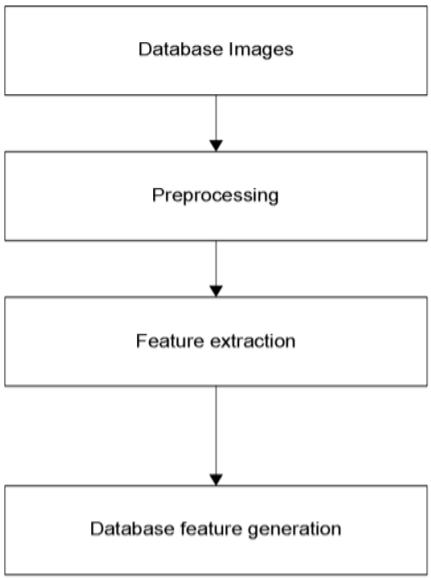
Improvement of an inescapable arrangement to test the uncommon highlights and general usefulness on a scope of stage blends is initially started by the test cycle. The methodology utilized is carefully quality controlled. The technique includes the utilization of pre-prepared picture recognizers with alterations to distinguish skin images. The measure confirms that the application is without bug and it meets the necessities expressed in the prerequisites report of the system.10 coming up next are the contemplations used to build up the structure from building up the testing philosophies.

Module Design Are

- Feature extraction module.

- Training module.

- Validation/Testing stage.



The project has been designed using the following software/language/frameworks:

- Machine Learning
- Deep Learning

5.1 Machine Learning

Machine Learning is that section of computer studies that gives the possibility to the computer to grab without being specifically programmed. AI is working in a wide scope of processing capacities where building and planning explicit calculations with better exhibitions are troublesome or wrong. AI is likewise unequivocally appended to computational measurements which makes expectation through computer vision simpler and practical. In business terms, Predictive Analysis is AI used to plan various calculations and models that impressively help forecast. Here the machine learns itself and gaps the information given into the degrees of forecast and gives the outcome precisely in a brief timeframe.

5.2 Deep Learning

Deep learning is that piece of the AI wherein the learning can be administered, unaided or semi-managed. Deep learning utilizes an enormous dataset for the learning cycle and the number of classifiers utilized gets diminished substantially. In Deep Learning the preparation time for the deep learning calculation builds on account of the utilization of the huge dataset. Deep learning calculation picks its properties while the machine inclining making the expectation cycle simpler for the end client as it doesn't utilize a lot of pre-preparing.

5.3 Understanding of Convolutional Neural Network (CNN) — Deep Learning

Convolutional neural network (ConvNets or CNNs) is one of the main categories under neural networks to do images recognition, images classifications. Some of the areas where CNNs are widely used are Objects detection, recognizing faces, etc

CNN uses image classifications and takes an input image, processes it and, classifies it under certain categories (Eg., Dog, Cat, Tiger, Lion). Computers observe an input image as an array of pixels and it relies on the image resolution. In the process of image resolution, it will see h x w x d(h = Height, w = Width, d = Dimension). Eg., An image of 6 x 6 x 3 array of a matrix of RGB (3 refers to RGB values) and an image of 4 x 4 x 1 array of a matrix of a grayscale image

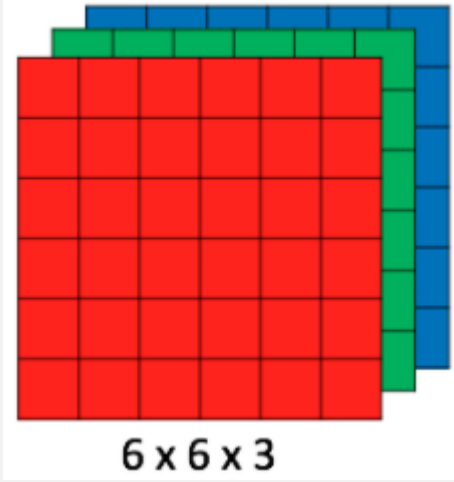


Figure 1 : Array of RGB Matrix

Methodologically, deep learning utilizes CNN models to prepare and test each information picture, which will be gone through a progression of convolution layers with channels (Kernals), Pooling, fully connected layers (FC) and, apply function, for example, Softmax to arrange an item with probabilistic qualities somewhere in the range of 0 and 1. The accompanying figure is a finished stream graph of CNN to handle an information picture and arrange the articles dependent on qualities.

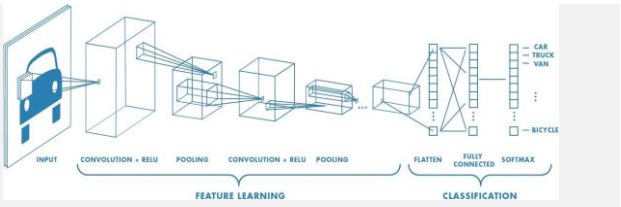


Figure 2 : Neural network with many convolutional layers

5.3.1 Convolution Layer

The main layer to extricate highlights from an info picture is the Convolution Layer. This layer saves the connection between pixels by learning picture highlights utilizing little squares of information. It is a numerical function that takes two inputs, an image matrix and, a filter or kernel.In Convolution of an image with different filters, we can perform operations such as edge detection, blur and, sharpen by applying filters. The following example given below shows various convolution images after processing different types of filters (Kernels).

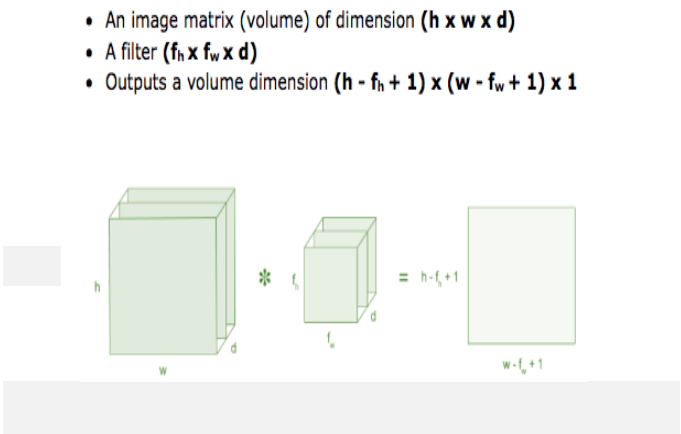


Figure 3: Image matrix multiplies kernel or filter matrix

Consider a 5 x 5 whose picture pixel esteems are 0, 1 and channel network 3 x 3 as demonstrated as follows

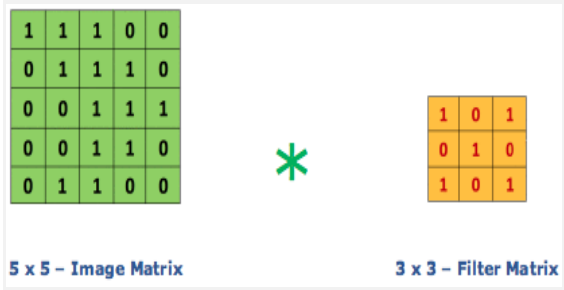


Figure 4: Image matrix multiplies kernel or channel grid

At that point the convolution of 5 x 5 picture grid increases with 3 x 3 channel network which is known as "Feature Map" as yield demonstrated as follows

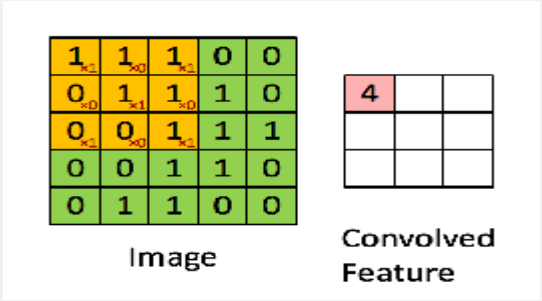


Figure 5: 3 x 3 Output matrix

In Convolution of an image with different filters we can perform operations such as edge detection, blur and sharpen by applying filters. The following example given below shows various convolution

image after processing different types of filters (Kernels).

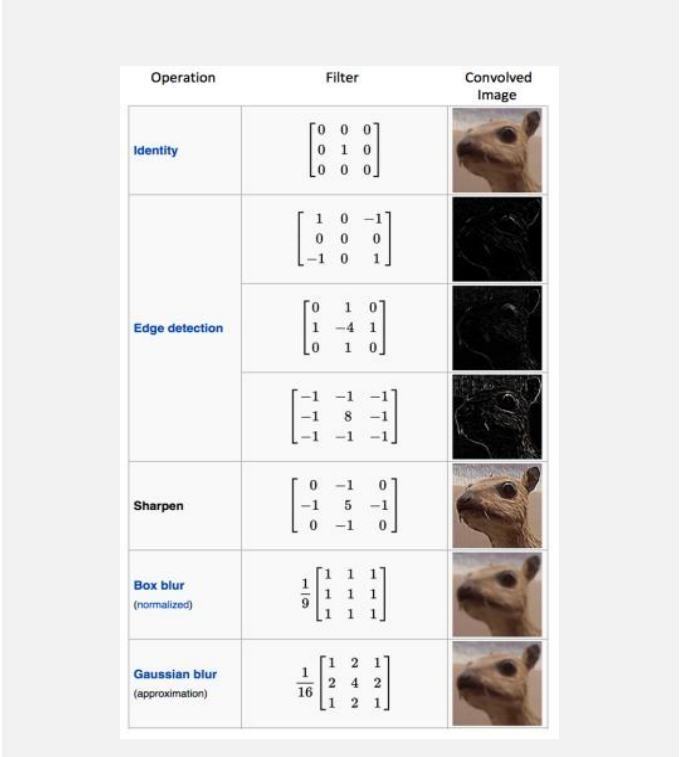


Figure 6 : Some common filters

4.3.2 Strides

Stride is the number of pixels shifting over the input matrix. In the first case, When the number of stride is 1 then we move the filters to 1 pixel at a time. In the second case ,When the stride is 2 then we move the filters to 2 pixels at a time and so on. The below figure shows convolution with a stride of 2.

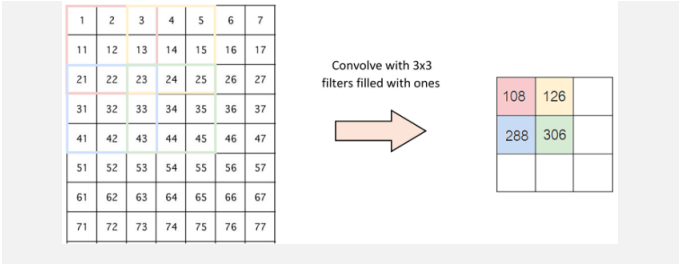


Figure 7 : Stride of 2 pixels

4.3.3 Padding

In some cases filter does not fit perfectly fit the input image. We have two choices:

- Firstly,Pad the picture with zeros (zero-padding) so that it fits
- Secondly,Valid padding in which ,Drop the part of the image where the filter did not fit. This is known as valid padding which keeps only valid part of the image.

4.3.4 Non Linearity (ReLU)

Rectified Linear Unit for a non-linear operation i.e. ReLU. The output for ReLU is ***f(x) = max(0,x).***

ReLU is important : It is important because ReLU's main function is to establish non-linearity in our ConvNet. Since, this present reality information would require our ConvNet to learn would be non-negative direct qualities.

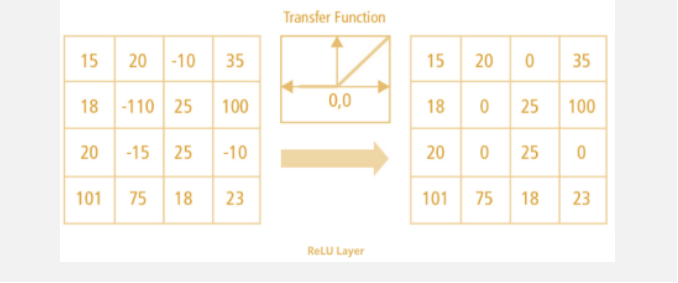


Figure 8 : ReLU operation

Other than ReLu there are other non linear functions such as tanh or sigmoid that can also be used in place of ReLU. But most of the data scientists use ReLU since performance wise and efficiency wise ReLU is better than the other two.

4.3.5 Pooling Layer

In Pooling layers branch,it would reduce the number of parameters when the images are too large. Spatial pooling also known as subsampling or downsampling which reduces the dimensionality of each map but employ important information. Spatial pooling can be categorized in following types:

- Max Pooling
- Average Pooling
- Sum Pooling

In Max pooling it takes the largest element from the rectified feature map. Taking the largest element could also take the average part and leads to average pooling. In the feature map ,Sum of all elements is known as sum pooling.

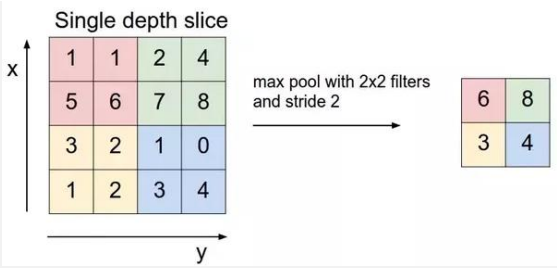


Figure 9 : Max Pooling

4.3.6 Fully Connected Layer

In the FC layer i.e. Fully Connected Layer, it flattened our matrix into vector and feed it into a fully connected layer like a neural network.

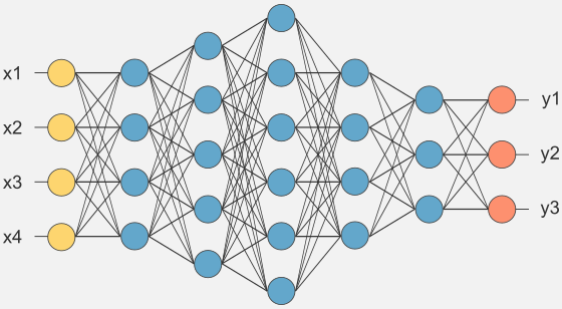


Figure 10 : After pooling layer, flattened as FC layer

The feature map matrix will be converted as vector (x1, x2, x3, …) in the above diagram. In the fully connected layers, we combined these features together to create a model. We can use an activation function such as softmax or sigmoid to classify the outputs as cat, dog, car, truck etc.,

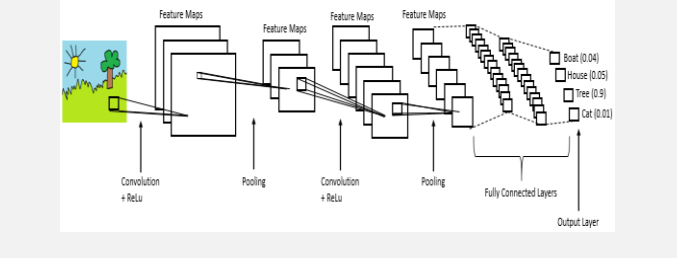


Figure 11 : Complete CNN architecture

4.4 Summary

- Providing an information picture into convolution layer
- Select boundaries, apply channels with steps, padding if requires. Perform convolution on the picture and apply ReLU actuation to the framework.
- Performing pooling to lessen dimensionality size
- Add the same number of convolutional layers until measures is fullfilled
- Flattening the yield and taking care of it into a completely associated layer (FC Layer)
- Finally,Output the class utilizing an enactment work (Logistic Regression with cost works) and characterizes pictures.

5. RESULTS

Trained accuracy: 91.74%

Value accuracy: 87.33%

6. CONCLUSION

This is a turn out model for expectation of skin illnesses is finished utilizing profound learning calculations. It is discovered that by utilizing the assortment highlights and profound learning we can accomplish a higher precision rate and furthermore we can likewise utilize the expectations of a lot a bigger number of infections than with different past models done previously. The above model would recognize skin malignant growth before all the manifestations been appeared to the casualty with the worth precision of 87% and the exactness for prepared information is around 91% for 4 sorts of skin Cancer in particular basal cell carcinoma, squamous cell carcinoma, benign and melanoma

ACKNOWLEDGEMENT

We would like to express our sincere thanks to our **Dean Dr. Parma Nand** for encouragement extended by him.It is our privilege to acknowledge with deep sense of gratitude to our project guide Prof. **Sunil Kumar** whose supervision, inspiration and valuable discussion has helped us tremendously to complete our project. Their guidance proved to be the most valuable to overcome all the hurdles in the fulfillment of this mega project on "SKIN DISESASE DETECTION". We would like to thank and, project coordinator, Computer Department, Sharda University, Gr.Noida for their support in planning and scheduling of our project. Our thanks to all the teaching and non-teaching staff of Sharda University for their help and support. We also need to thank our parents, family members, and all well-wishers along with the almighty without whom this work would not have taken shape.

REFERENCES

[1] .Shapiro, .A H., The Dynamics and Thermodynamics of Compressible Fluid Flow - Vol.1, The Ronald Press Company,New York, 1953,p.383-384.

[2] Jiang, Z., Takayama, K., and Skews, B. W., "Numerical Study on Blast Flow Fields Induced by Supersonic projectiles Dischargedfrom Shock Tubes," Physics of Fluids, Vol.10, No.1, 1998,pp.277-288.

[3] Ahmadikia, H. and Shirani, E., "Transonic and Supersonic Overtaking of a Projectile Preceding a Shock Wave," Report- IC/2001/48, International Centre for Theoretical Physics, Italy,2001.

[4]..https://medium.com/@mishaallakhani/detecting-skin-cancer-using-deep-learning- 82deba830328

[5]. Carl Louie Aruta,Colinn Razen Calaguas,Jan Kryss Gameng,Marc Venneson Prudentino and August Anthony Chestel J. Lubaton -Versatile based Medical Assistance for Diagnosing Different Types of Skin Diseases Using Case-based Reasoning with ImageProcessing(2015) http://wairco.org/IJCCIT/October2015Paper54.pdf

[6]. Ledisi G. Kabari andFrancis Bakpo- Diagnosing Skin Diseases Using an Artificial Neural Network (2009)

https://ieeexplore.ieee.org/document/5409725

[7]. Hani K. Al-Mohair,Junita Mohamad Saleh and

Shahrel Azmin Suandi- Hybrid Human Skin Detection Using Neural Network and K-Meaan Clustering Technique (2015)

https://www.sciencedirect.com/science/article/abs/pii/S1568494615002732

[8]. Munirah M. Yusof,Ruhaya A. Aziz And Chew S. Fei- The Development of Online Children Skin Diseases Diagnosis System (2013)http://www.ijiet.org/papers/270-IT3004.pdf

[9]. Sourav Kumar Patnaik,Mansher Singh Sidhu,Yaagyanika Gehlot,Bhairvi Sharma And P. Muthu-Automated skin disease identification using deep learning algorithm

(2019)https://biomedpharmajournal.org/vol11no3/automated-skin-disease-identification-using-deep-learning-algorithm/

[10]. Shashi Rekha ,Prof.H.Srinivasa And Dr.Sudarson Jen-Digital Dermatology - Skin Disease Detection Model Using Image Processing(2018)http://www.ijirset.com/upload/2018/july/7_1_DIGITAL.pdf

[11]. M Manoj krishna, M Neelima, M Harshali, M Venu Gopala Rao-Image classification using deeplearningvMarch2018

[12]. REMOTE SKIN DISEASES DIAGNOSIS SYSTEM USING MACHINE LEARNING TECHNIQUES BY RANA MOHAMMED ALHADI ABD ALKAREEM ALSHEIKH EDREES http://khartoumspace.uofk.edu/bitstream/handle/123456789/25830/SDDS%20RANA.pdf?sequence=1&isAllowed=y

[13]. Computer-Aided Diagnosis of Skin Diseases using Deep Neural Networks-

Muhammad Naseer Bajwa 1,2,*, Kaoru MutaMuhammad Imran Malik 4,5, Shoaib Ahmed Siddiqui 1,2 , Stephan Alexander Braun 6,7 , Bernhard Homey 7, Andreas Dengel 1,2 and Sheraz Ahmed 2

https://doi.org/10.3390/app10072488

[14]. A Method Of Skin Disease Detection Using Image Processing And Machine Learning Nawal Soliman ALKolifi ALEnezi https://www.researchgate.net/deref/http%3A%2F%2Fdx.doi.org%2F10.1016%2Fj.procs.2019.12.090