International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 10 Issue: 02 | Feb 2023 www.irjet.net p-ISSN: 2395-0072

Common Skin Disease Diagnosis and Prediction: A Review

Mr. Laxman J. Deokate[1], Ruchika K. Gaikwad [2], Samruddhi M. Gaikwad [3], Atharva P. Gurav [4], Deep R. Khadke [5]

[1]Asst. Prof., Department of Information Technology
Vidya Pratishthan's Kamalnayan Bajaj Institute of Engineering and Technology, Baramati
[2,3,4,5]UG students, Department of Information Technology
Vidya Pratishthan's Kamalnayan Bajaj Institute of Engineering and Technology, Baramati

---

Abstract - *The integration of computer technology into the healthcare industry has been driven by the proliferation of electronic data. Skin diseases, which can range from common to rare disorders, present a unique challenge for medical professionals in terms of diagnosis. Machine learning and deep learning algorithms have shown potential for improving the early detection of high-risk skin disorders and displacing traditional diagnostic systems. This paper aims to evaluate the performance of various machine learning and deep learning models in diagnosing skin diseases by analyzing performance indicators. We trained our model using deep learning, a type of machine learning that leverages large data sets, reducing the need for multiple classifiers. This approach enhances dermatology by allowing the machine to continuously learn, categorize input data into appropriate prediction levels, and provide accurate results in a timely manner. Our model utilized Convolutional Neural Network (CNN), a widely used method for image categorization.*

Key Words: **Skin Disease, Machine Learning, Deep Learning, Neural Network, Convolutional Neural Network (CNN)**

1. INTRODUCTION

Dermatology is a complex and challenging field due to the diversity of diseases that affect the hair, skin, and nails. These diseases are influenced by various environmental and genetic factors, leading to different symptoms and prognoses. Some diseases, like eczema and psoriasis, are chronic and incurable, while others, like malignant melanoma, can be life-threatening if not detected early.

Deep learning is a subfield of machine learning that utilizes large datasets to reduce the number of classifiers needed for the learning process. Unlike traditional machine learning, deep learning algorithms have the ability to automatically select and extract features, making predictions easier for end users with minimal pre-processing. Convolutional Neural Networks (CNNs) are a popular type of artificial neural network used in image recognition and classification tasks. They have been shown to be effective in recognizing faces, objects, and traffic signs, and are also used in areas such as robotics and self-driving cars.

Skin diseases are becoming increasingly prevalent, affecting people of all ages. In order to detect these diseases, we utilized a CNN, a type of deep neural network that has the ability to independently learn and categorize data into prediction levels, producing accurate results quickly. The most commonly occurring diseases in the data set include melanocytic nevi, melanoma, benign keratosis-like lesions, basal cell carcinoma, actinic keratoses, vascular lesions, and dermatofibromas. Despite their prevalence, diagnosing these diseases is complex due to the variations in skin tone, color, and hair.

1.1 Skin Diseases:

Malignancies that affect the skin include skin cancer, which if untreated, can have major negative effects on one's health. Melanoma, squamous cell carcinoma and basal cell carcinoma are the three major types of skin cancer. The most common kind, basal cell carcinoma, is distinguished by tiny, flesh- colored skin growths. On the other hand, squamous cell carcinoma starts in the skin's surface flat cells. Skin cancer that is more serious and tends to be dark in color, called melanoma, begins in the cells that produce pigment. Exposure to ultraviolet (UV) radiation from the sun or tanning beds, a family history of the disease, having light skin, and a history of sunburns are risk factors for developing skin cancer. It's also important to note that skin cancer can occur in areas that are not frequently exposed to the sun.

Early skin cancer identification and treatment are crucial. Any moles that appear suddenly or that change should be examined by a doctor. The best course of action for treating skin cancer will depend on the kind and stage of the disease. Treatment options range from surgery to radiation and chemotherapy. Use a sunscreen with a high SPF, wear protective clothes, find shade during the sun's peak hours, and wear protective eyewear to protect your skin from UV rays. Regular self-examinations and dermatologist visits can also aid in the early identification of skin cancer when it is still the most curable.

1.2. Deep Learning:

Artificial neural networks that are modelled after the human brain are used in deep learning to assess and resolve complicated issues. Without the need for manual feature engineering, it lets computers to learn from data and make predictions. Many different activities, including picture and audio recognition, natural language processing, and gaming, may be performed using deep learning techniques.

Deep learning models must be trained using enormous quantities of data and processing power, although technological advances in hardware and cloud computing have made this less difficult. Deep learning has significant promise for innovations and increased precision in a variety of applications as it develops.

Deep learning networks can have complex structures with several layers and numerous parameters, which makes training difficult. Deep learning models may, nevertheless, produce analyses and predictions with extremely high accuracy due to the rise in processing power and data availability.

1.3 Convolutional Neural Network:

Deep learning algorithms such as convolutional neural networks (CNNs) have completely changed the way computer vision is studied. They are particularly suited for image classification jobs because they employ several layers to study and discover patterns and characteristics in pictures and videos. Convolutional layers, which apply filters to the input database to detect features, pooling layers, which reduce the spatial dimensions of the data to streamline computation, and fully connected layers, which use the features discovered by the previous layers to make predictions, make up the architecture of a CNN. The capacity of CNNs to learn hierarchical representations of the data, starting with simple characteristics and progressing to more complex ones, is one of its main advantages. This enables them to forecast images with accuracy.

2. Literature Survey

[1] Ahmed A. Elngar, Rishabh Kumar, Amber Hayat, Prathamesh Churi "**Intelligent System for Skin Disease Prediction using Machine Learning**"

Skin diseases occur in almost all age groups of people. There are chronic and incurable diseases such as eczema and psoriasis and malignant diseases such as malignant melanoma. Recent scientists have found the availability of drugs for these diseases if they are detected in the early stages. It has been published for the detection of these diseases using an image processing method. The most dangerous form of skin cancer among other types of skin is melanoma. Skin diseases are often difficult to detect at an early stage and even more difficult to classify on their own. Image classification is one of the classic problems in image processing. This article gives us an overview of the existing machine learning and image processing algorithms for skin disease detection through Android application development. One in five people in the US is infected with some kind of skin disease. There are chronic and incurable diseases such as eczema and psoriasis and malignant diseases such as malignant melanoma. To detect these diseases using the image processing method. Skin disease detection methods using methods such as Naïve Bayes, CNN, SVM were used. The most dangerous form of skin cancer is melanoma because it is much more likely to spread to other parts of the body if not diagnosed and treated early. The literature review shows that CNN and SVM are the most suitable algorithms for the detection of skin diseases. In these articles, we have used OpenCV image processing along with machine learning algorithms to detect various skin diseases. The application also provides the doctor with a control panel to manage his patient remotely and can identify the patient's illness at a remote location. There are approximately 2.3 billion Android devices in use worldwide, which is 1/3 of the total world population. In short, identifying the disease can help reduce the problem of the spread of skin diseases. This will provide an inexpensive method of medical treatment. Most skin diseases can be easily spread by touch. In our application, we used a modified pre-trained convolutional neural network model and SVM algorithm. For the classification of six classes, 92% accuracy is achieved.

[2] Kritika Sujay Rao, Pooja Suresh Yelkar, Omkar Narayan Pise, Dr. Swapna Borde **"Skin Disease Detection using Machine Learning"**

A new system has been developed for the diagnosis of the most common skin lesions. 93% accuracy is achieved in classification using Convolution Neural Networks (CNN) with Keras Application API. The watchword in these steps is "Data Preprocessing and Enhancement: Trash In-Good Out". They examined various properties of the data set, their distributions, and actual counts. Data transformation involves converting data from one format to another. Model Building involves building a deep neural network (CNN or ConvNet). Backpropagation is a strategy in artificial neural networks (ANN) to find out the error contribution of each neuron after processing a burst of data. Backpropagation is quite sensitive to noisy data. Data cleaning is performed to remove null values, smoothing noisy data by identifying or removing outliers, and removing inconsistencies. Skin cancer-MNIST (Modified National Institute of Standards and Technology Database)-HAM 10000.dataset is been used. Artificial Neural Network (ANN) & Back Propagation Network (BPN) are used in this research. In conclusion, the work presents a robust automated method for the diagnosis of dermatological diseases in the European Society of Medical Oncology. Skin diseases are the fourth most common cause of human disease, but many still do not consult a doctor. We should emphasize that it is intended to replace

doctors, because no machine can yet replace human input into analysis and intuition.

[3] Sourav Kumar Patnaik, Mansher Singh Sidhu, Yaagyanika Gehlot, Bhairvi Sharma and P Muthu **"Automated Skin Disease Identification using Deep Learning Algorithm"**

In order to forecast numerous skin disorders that are prevalent yet challenging to detect owing to complications such skin tone and colour, this study provides a computer vision-based solution employing deep learning. The algorithm predicts skin illnesses based on the highest number of votes using three modified, freely accessible image recognition models (InceptionV3, InceptionResnetV2, and Mobile Net). These models undergo a three-stage process of feature extraction, training, and testing/validation before being pre-trained to recognise 1000 classes using skin photos. The technology aims to anticipate skin disorders with the greatest possible precision. Due to the wide range of illnesses affecting the skin, hair, and nails as well as the difficulties in diagnosing these illnesses, dermatology is a complicated and unreliable branch of study. For the proper diagnosis of skin disorders, a variety of pathological laboratory tests are required. , however, this research suggests a technique that enables users to forecast skin problems using computer vision without requiring time-consuming laboratory tests. The study outlines a method for predicting skin conditions using computer vision and deep learning. With changes for skin disease prediction, the system leverages three publically accessible image recognition architectures (InceptionV3, InceptionResnetV2, Mobile Net) and predicts the illness based on the combination of votes from the three networks. The technology aims to anticipate skin illnesses as accurately as possible. Due to advancements in medical technology and computers' capacity to handle and analyse massive volumes of data, the use of computer technology in the detection of skin disorders has increased. The study emphasizes the use of supervised, unsupervised, and semi-supervised learning techniques for this purpose, concentrating on machine learning and deep learning algorithms. Three parts make up the proposed computer vision system for predicting skin diseases: feature extraction, training, and testing/validation. The method employs deep learning technology to extract significant characteristics from photos of skin diseases during the feature extraction phase. These architectures have been pre-trained to identify up to 1000 classes of pictures. The system checks the algorithm using validation data during the test/validation phase in order to determine how accurate it is at predicting skin diseases. To forecast skin problems, the algorithm takes the most votes from the three networks. The major objective of this method is to forecast skin diseases as accurately as possible. In comparison to manual, time-consuming approaches that call for specialized expertise, the system employs computer vision and deep learning to deliver a more effective and automated method for identifying skin diseases.

[4] T. Swapna, D.A. Vineela, M. Navyasree, N. Sushmtha, P. Bhavana **"Detection and Classification of Skin diseases using Deep Learning"**

The fastest-growing and most vital tissue in the human body, according to research, is skin. Doctors and modern tools are necessary to identify various skin disorders due to the low visual resolution of skin disease pictures. basis for a picture Dermatologists must be often consulted for manual skin disease diagnosis. Deep learning algorithms have recently been employed in studies on the categorization of skin diseases. The system has an accuracy of 85% on the HAM10000 dataset for skin diseases. A system that divides pictures of skin lesions into benign, malignant melanoma, benign acne, and eczema categories was designed, built, and tested using AlexNET, a pretrained CNN model. 750 additional photos of burns and skin lesions have been added to the collection, which has been enlarged. Burns and skin wounds are now included in the modern classifications of skin disorders. In this study, warts, shellfish, systemic illness, seborrheic keratosis, nevus, bullous, actinic keratosis, acne, and rosacea were all examined. A deep learning-based technique for detecting skin diseases is included in the proposed framework. This method recognises and categorises skin conditions. Using CNN, Resnet, Alexnet, and Inceptionv3, researchers proposed developing a worldwide categorization system for skin problems. Additionally, it has been demonstrated that Resnet detects skin problems more precisely than other networks.

[5] Pravin R. Kshirsagar, Hariprasath Manoharan, S. Shitharth, Abdulrahman M. Alshareef, Nabeel Albishry and Praveen Kumar Balachandran**." Deep Learning Approaches for Prognosis of Automated Skin Disease."**

One of the most common diseases on the planet is skin problems. People often ignore the early symptoms of skin conditions. In this study, a classification system for skin disorders was developed using MobileNetV2 and LSTM. Simulated skin injury, chemical exposure, infection of the embryo, immune system and genetic problems are all factors in the development of skin diseases. Technological advances have made it possible to plan and conduct skin observations early in the diagnosis of underlying skin disorders. Through automated skin disease diagnosis methods, skin diseases can be predicted quickly and accurately with high throughput. Skin conditions detected early can help prevent more serious conditions such as skin cancer. This section describes the components of a combined approach for detecting skin disorders. In order to develop a device that can accurately detect skin problems, several factors must be observed. Good image separation is needed to predict skin disease. Standardization is important for computerized methods for identifying skin problems.

[6] K. A. Muhaba1, K. Dese, T. M. Aga, F. T. Zewdu, G. L. Simegn. **"Automatic Skin Disease Diagnosis Using Deep Learning from Clinical Image and Patient Information"**

Using deep learning and a pre-trained mobilenet-v2 model, an unique method was developed to identify five prevalent skin illnesses. Overall, the invention of this system marks a huge step forward in medical science and has the potential to significantly improve the quality of life of persons suffering from skin illnesses.
A pre-trained mobilenet-v2 model was used to create an automated skin disease diagnostic system. To efficiently classify skin illnesses, the method blends skin photos with clinical patient information. This technology has the potential to give more thorough diagnoses, resulting in improved treatment results for patients by merging skin pictures and patient information. The use of pre-trained models also reduces the time and resources required for training and development, making the system more accessible and convenient to use in a range of scenarios.

Dr. Gerbi's central clinic collected 1137 photographs and patient information, whereas our study collected 239 photos and data from 286 patients at two medical clinics in Ethiopia. The material included skin photos as well as patient information such as age, gender, anatomic areas of skin illness, and symptoms. The study also revealed common symptoms and anatomical areas for five different skin disorders.

To categorise skin conditions, the scientists used transfer learning to a pre-trained MobileNet-v2 model. They discovered that the Adam optimizer, a cross-entropy loss function, and a learning rate of 0.0001 produced the best results for both binary and multiclass classification.

The algorithm was trained on huge picture datasets before being fine-tuned for skin disease categorization. In conclusion, our work effectively utilised transfer learning to skin disease categorization using the pre-trained MobileNet-v2 model and produced good results. In this work, deep learning techniques were used on clinical photos and patient information to build a smartphone-based skin disease detection system. For the diagnosis of five prevalent skin illnesses, the findings demonstrated good performance with an average accuracy of 97.5%, precision of 97.7%, recall of 97.7%, F1-score of 97.5%, and kappa score of 0.976.

[7] Parvathaneni Naga Srinivasu, Jalluri Gnana SivaSai, Muhammad Fazal Ijaz 3, Akash Kumar Bhoi, Won Joon Kim, and James Jin Kang. **"Classification of Skin Disease Using Deep Learning Neural Networks with Mobile Net V2 and LSTM"**

A deep learning strategy for skin disease categorization utilizing Mobile Net V2 and Long Short-Term Memory (LSTM) models was developed in this paper. With more than 85% accuracy, the suggested system beat existing cutting-edge models such as Fine-Tuned Neural Networks (FTNN), Convolutional Neural Networks (CNN), and Visual Geometry Group (VGG) Very Deep Convolutional Networks. Skin illnesses may be identified using image processing techniques and AI technologies such as Machine Learning, Deep Learning, Artificial Neural Network (ANN), Convolutional Neural Network (CNN), Support Vector Machines (SVM), Bayesian Classifier, Genetic Algorithm (GA), and morphological operations. SVM is not ideal for processing noisy image data, ANN and CNN require a huge quantity of training data, fine-tuned neural network-based models offer high accuracy but require significant effort in calibration, and so on. Back Propagation Neural Networks (BPNN) may forget previously linked weights, Fuzzy Recurrent Neural Networks (FRNN) and Takagi-Surgeon-Kang Fuzzy Classifier are ideal for processing variable-size inputs, and GLCM is a statistical technique that is not invariant to rotation and texture changes. The suggested model, which is based on Mobile Net V2 and LSTM, was evaluated and produced accurate results for skin illnesses (85.34%).

3. Proposed Work

3.1 System Architecture

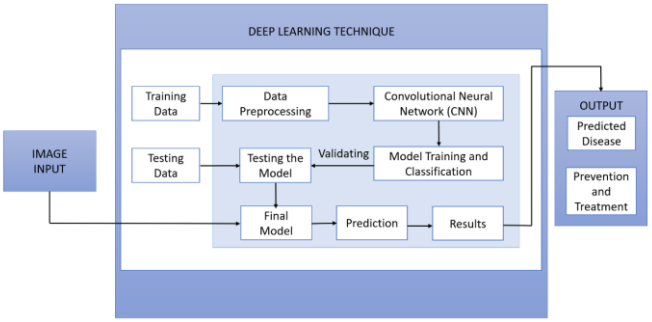

Fig -1: Proposed System Architecture

3.2 System Design

3.2.1 Data Collection - The skin disease detection system was evaluated using images from the publicly available Skin Cancer-MNIST (Modified National Institute of Standards and Technology Database)-HAM10000 dataset. To save time and effort, publicly available data was utilized.

3.2.2Data Pre-processing - To ensure accurate results, the first step in data processing was cleaning the data. This included filling in missing values, smoothing noisy data, identifying and removing outliers, and removing inconsistencies. During pre-processing, the image data was transformed into meaningful tensors and fed into the convolutional neural network.

3.2.3 Data Transformation - This involves converting data from one format to another, such as transforming actual values from one representation to another.

3.2.4 Modelling - A convolutional neural network (CNN) was used. CNNs are a type of deep neural network where the machine itself learns to divide the data into prediction levels and produce accurate results in a short time. This network consists of a combination of convolutional layers, pooling layers, and fully connected layers. CNNs are the most effective algorithm for image classification, with features such as sparse connectivity, shared weights, and pooling capabilities playing a critical role in obtaining the best results. Additionally, the use of GPUs has reduced the training time of deep learning methods, and huge data labelled and pre-trained networks are now publicly available.

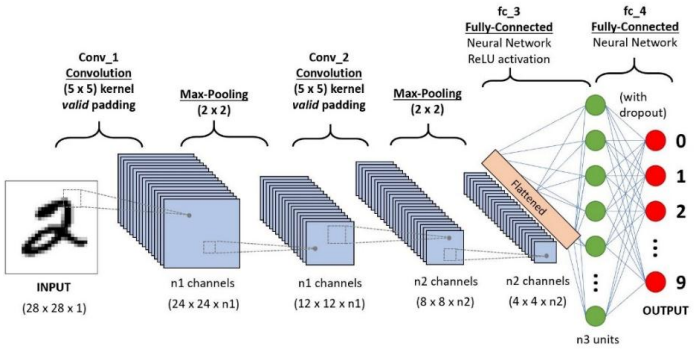

Fig -2: Simple CNN Architecture

3.3 Data Flow Diagram

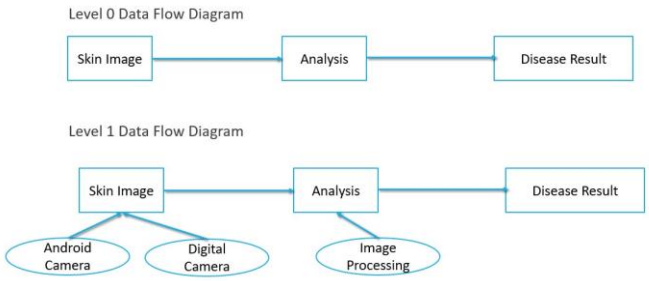

Fig -3: Data Flow Diagram

3.4 Activity Diagram

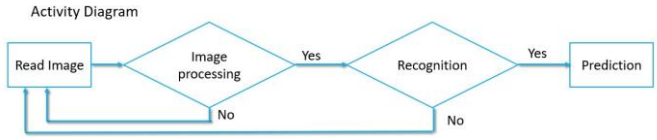

Fig -4: Activity Diagram

4. CONCLUSIONS

In this work, a model for the prediction of skin diseases using deep learning algorithms is created. It has been found that by using feature compounding and deep learning, we can achieve higher accuracy and also predict many more diseases than other previous models. Like the previous models, in this one area of use, we were able to report a maximum of six skin conditions with a maximum accuracy of 75%. According to the implementation of a deep learning algorithm, we are able to predict up to 20 diseases with an accuracy of 70 percent. This proves that deep learning algorithms have huge potential in real-world skin disease diagnosis. If an even better system with high-end system hardware and software is used with a very large data set, the accuracy can be increased considerably, and the model can be used for clinical experimentation as it does not have any invasive measures. Future work can be extended to make this model a standard procedure for the method of preliminary diagnosis of skin diseases, as it will reduce the time of treatment and diagnosis.

REFERENCES

[1] Kritika Rao, Pooja Yelkar, Omkar Pise and Dr. Swapna Borde,and ,"Skin Disease Detection using Machine Learnings", 2021.

[2] Ahmed A. Elngar, Rishabh Kumar, Amber Hayat, Prathamesh Churi, "Intelligent System for Skin Disease Prediction using Machine Learning", August 2021.

[3] Sourav Kumar Patnaik, Mansher Singh Sidhu, Yaagyanika Gehlot, Bhairvi Sharma and P Muthu "Automated Skin Disease Identification using Deep Learning Algorithm", September 2018.

[4] T. Swapna, D.A. Vineela, M. Navyasree, N. Sushmtha, P. Bhavana "Detection and Classification of Skin diseases using Deep Learning."

[5] Pravin R. Kshirsagar, Hariprasath Manoharan, S. Shitharth, Abdulrahman M. Alshareef, Nabeel Albishry and Praveen Kumar Balachandran." Deep Learning Approaches for Prognosis of Automated Skin Disease."

[6] K. A. Muhaba1, K. Dese, T. M. Aga, F. T. Zewdu, G. L. Simegn. "Automatic Skin Disease Diagnosis Using Deep Learning from Clinical Image and Patient Information"

[7] Parvathaneni Naga Srinivasu, Jalluri Gnana SivaSai, Muhammad Fazal Ijaz 3, Akash Kumar Bhoi, Won Joon Kim, and James Jin Kang. "Classification of Skin Disease Using Deep Learning Neural Networks with Mobile Net V2 and LSTM."