IMAGE CLASSIFICATION TO DETECT SKIN DISEASE

Megha Agarwal, Arieyshma Chowhan, Shruti Jani, Hansika Koli, Charmi Chaniyara

[1234] B.E. Student,[5] Assistant Professor

[1] Information Technology

[1] Atharva College of Engineering, Mumbai, India

Abstract - The most prevalent diseases in the world are skin disorders. Because of the problems with their skin texture, the existence of hair on their skin, and their skin color, diagnosing them is quite challenging. To improve the diagnostic accuracy of various types of skin diseases, techniques like machine learning must be developed. The application of machine learning techniques in the medical field is common for diagnosis. In order to decide, these algorithms employ feature values from photos as input.

The feature extraction stage, the training stage, and the testing stage are the three stages of the procedure. Utilizing different skin imaging datasets, the technique trains itself using deep learning technologies. The goal of this procedure is to improve the diagnosis of skin diseases. Texture, color, shape, and their combinations are three crucial elements in image classification. In this study, the skin illness is categorized using criteria of color and texture. The color of healthy skin differs from that of diseased skin. Using texture attributes in the photos, it is possible to distinguish between smoothness, coarseness, and regularity. In order to accurately detect skin illness, these two traits are investigated. In this study, the skin illness is identified using the proposed hybrid model of inception v3 and ResNet. Accuracy is used to gauge how well the suggested algorithm works.

I. INTRODUCTION

The dermatological condition is one of the most widespread diseases in the globe. Despite being common, it can be quite difficult to diagnose due to the complexity of the skin, hair, and color variations. Our research provides a method for using deep learning and other computer vision-based approaches to forecast various skin conditions automatically. Most diagnoses made today about a patient's current symptoms are frequently based on the doctor's years of experience or their own subjective judgements, which can result in mistakes and postpone the treatment of these. Therefore, both theoretically and practically, it is crucial to learn how to recognize the signs of various skin diseases utilizing current research and technology. In this case, the various skin illnesses can be successfully and accurately detected.

PURPOSE

The goal of developing a skin disease detection system utilising ResNet and Inception V3 is to give dermatologists and other healthcare practitioners a dependable and accurate tool to aid in the diagnosis of skin illnesses. Even for skilled dermatologists, diagnosing skin diseases effectively can be challenging because many illnesses share similar symptoms and are readily misinterpreted. The system may learn to spot patterns and attributes connected to various skin illnesses by employing deep learning models like ResNet and Inception V3, which are trained on massive datasets of skin photos. By delivering prompt and efficient treatment, this can help in the accurate diagnosis of skin disorders and improve patient outcomes.

OBJECTIVES

- By creating an automated computer-based method for classifying skin diseases from photos using deep learning and neural networks, the aim is to increase diagnostic accuracy.
- The system also has the ability to gather data as input and use it as a tool for diagnostics.
- The sequential model helps the model perform better by keeping state information on the traits found in earlier picture categorization generations. It is used to determine the type of skin illness.

II. LITERATURE SURVEY

[4] **Pravin R. Kshirsagar, Hariprasath Manoharan, S. Shitharth, Abdulrhman M. Alshareef, Nabeel Albishry and Praveen Kumar Balachandran** used Deep learning methods could be used to build frameworks capable of detecting various skin conditions. To detect skin diseases, skin and non-skin tissue must be distinguished. Using MobileNetV2 and LSTM, this study created a skin disease classification system. The primary goal of this system is to forecast skin diseases accurately while also ensuring excellent efficiency in storing complete state information for precise forecasts.

[2] **Parvathaneni Naga Srinivasu, Jalluri Gnana SivaSai, Muhammad Fazal Ijaz , Akash Kumar Bhoi, Wonjoon Kim , and James Jin Kang** proposed a deep learning-based MobileNet V2 and Long Short Term Memory-based computerised process for classifying skin diseases (LSTM). The MobileNet V2 model proved to be efficient and accurate, and it can operate on lightweight computational devices. The results were compared to other cutting-edge models such as Fine-Tuned Neural Networks (FTNN), Convolutional Neural Networks (CNN), Very Deep Convolutional Networks for Large-Scale Image Recognition developed by Visual Geometry Group (VGG), and convolutional neural network architecture that expanded with few changes.

[1] **Ling-Fang Li; Xu Wang; Wei-Jian Hu; Neal N. Xiong; Yong-Xing** Du examine 45 research efforts on skin disease identification using deep learning technology since 2016. They examine these studies in terms of disease type, data set, data processing technology, data augmentation technology, skin disease image recognition model, deep learning framework, evaluation indicators, and model performance. Furthermore, they summarise the traditional and machine learning-based methods for diagnosing and treating skin diseases.

[3] **Muhammad Naseer Bajwa ,Kaoru Muta ,Muhammad Imran Malik ,Shoaib Ahmed Siddiqui ,Stephan Alexander Braun , Bernhard Homey** trained state-of-the-art Deep Neural Networks on two of the largest publicly available skin image datasets, DermNet and ISIC Archive, and used disease taxonomy to improve classification performance of these models where available. DermNet establishes new standards for disease classification with 80% accuracy and 98% Area Under the Curve (AUC) for 23 diseases.

III. PROPOSED SOLUTION

We have built an automated computer-based system that uses deep learning and neural networks to improve diagnostic accuracy for categorizing skin disorders from pictures. Data can be gathered by the system as input, and it can then use that data to perform a diagnostic. For more accurate skin disease detection, a hybrid model combining ResNet and Inception v3 models may be a good option. Popular deep learning models ResNet and Inception v3 have both shown remarkable outcomes in image identification tests.

By employing skip connections, ResNet, a deep residual neural network, can acquire incredibly detailed representations of images. To capture both fine and coarse features in an image, Inception v3 is a convolutional neural network that combines a variety of convolutional filters of various sizes.By merging these two models, we can increase the precision of skin disease detection by taking advantage of their complementing qualities. The Inception v3 model may be used to capture both fine and coarse features in the photos, while the ResNet model can be used to extract deep features from the images.

To reduce classification error, the hybrid model can be trained on a huge collection of skin disease photos. The correctness of the model can then be verified on a different validation set. Data augmentation strategies can be used to broaden the diversity of the training data, which will raise the model's accuracy. The pre-trained ResNet and Inception v3 models on the skin disease dataset can also be improved via transfer learning.

Overall, a hybrid model combining ResNet and Inception v3 models can be a useful tool for more accurately diagnosing skin conditions, and it can be further enhanced using approaches like data augmentation and transfer learning.

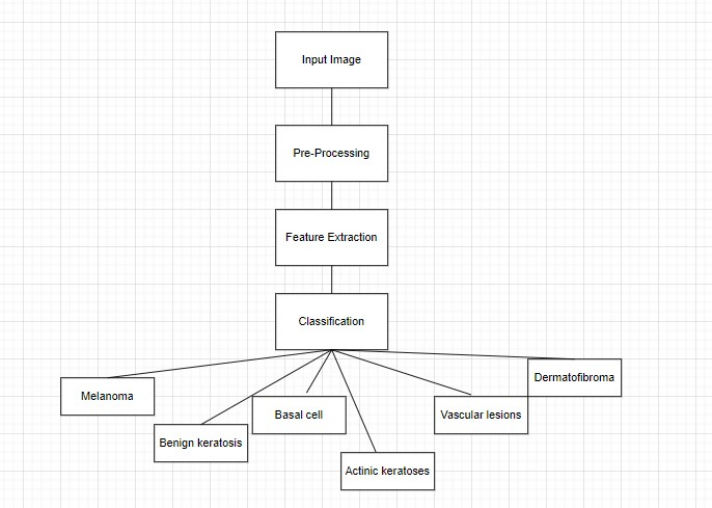

Fig 3.1 DFD (data flow diagram)

IV. METHODOLOGY

In reference to the fig 3.1 , following method can be used to diagnose skin diseases using a hybrid ResNet and Inception v3 model:

- Dataset Gathering: Get a sizable dataset of pictures depicting skin conditions, preferably from reputable sources. Make sure the dataset is broad enough to include various populations and skin problems.
- Data preprocessing: Do preprocessing on the photos to make sure they are the proper size and format. To expand the dataset and lessen overfitting, use data augmentation techniques like flipping, rotating, and zooming.
- Model Integration: To generate the hybrid model, use an ensemble method to combine the ResNet and Inception v3 models. The final prediction is made in this method by concatenating the outputs of the ResNet and Inception v3 models and then passing them through a few more layers.
- Model Training: Use the preprocessed dataset to train the hybrid model. For the skin disease dataset, fine-tune the model using methods like transfer learning. To avoid overfitting, employ regularisation strategies like dropout and weight decay.
- Use metrics like accuracy, precision, recall, and F1 score to assess the model. Additionally, employ strategies like confusion matrices and ROC curves to fully comprehend the model's performance.

V. CONCLUSIONS

In conclusion, a potent instrument for identifying skin diseases is the combination of ResNet and Inceptionv3 models. We can develop a highly accurate skin disease detection system by combining the advantages of both models, such as ResNet's effective use of computational resources and Inceptionv3's capacity to manage complex image features. Using methods like transfer learning, data augmentation, and ensemble learning, we can develop a system that is capable of correctly classifying skin lesions by fine-tuning these models using data on skin diseases. Additionally, using methods like thresholding and the softmax classifier can aid the system's accuracy and increase its value for clinical diagnosis.

Inceptionv3 and ResNet models together offer a promising method for creating systems that accurately and consistently identify skin diseases.

VI. FUTURE SCOPE

- Mobile Applications: Mobile apps that use the combination of ResNet and Inceptionv3 models for skin disease detection may be developed as a result of the rising popularity of mobile devices. This might make it possible for patients to take pictures of their skin lesions and get a quick assessment of the probability that a specific disease is present.
- Multi-Modal Approaches: ResNet and Inceptionv3 models could be coupled with other modalities, like histopathology or dermatoscopy, to boost precision and dependability. For patients, this might result in more accurate diagnoses and improved treatment outcomes.
- Expansion to Other Medical Fields: Beyond skin conditions, the combination of ResNet and Inceptionv3 models may be used to identify other medical problems. For instance, it might be used to identify lung or eye conditions, creating novel avenues for medical diagnosis.
- Improved Accuracy: There is still room for growth, despite the fact that the combination of ResNet and Inceptionv3 models has shown promise for correctly detecting skin diseases. Future studies could concentrate on creating more complex models that can accurately handle a broader variety of skin conditions.

VII. REFERENCES

[1] L. -F. Li, X. Wang, W. -J. Hu, N. N. Xiong, Y. -X. Du and B. -S. Li, "Deep Learning in Skin Disease Image Recognition: A Review," in IEEE Access, vol. 8, pp. 208264-208280, 2020, doi: 10.1109/ACCESS.2020.3037258.

[2] Srinivasu, P.N.; SivaSai, J.G.; Ijaz, M.F.; Bhoi, A.K.; Kim, W.; Kang, J.J. Classification of Skin Disease Using Deep Learning Neural Networks with MobileNet V2 and LSTM. Sensors 2021, 21, 2852.

[3] Bajwa, M.N.; Muta, K.; Malik, M.I.; Siddiqui, S.A.; Braun, S.A.; Homey, B.; Dengel, A.; Ahmed, S. Computer-Aided Diagnosis of Skin Diseases Using Deep Neural Networks. Appl. Sci. 2020, 10, 2488.

[4] Kshirsagar PR, Manoharan H, Shitharth S, Alshareef AM, Albishry N, Balachandran PK. Deep Learning Approaches for Prognosis of Automated Skin Disease. Life (Basel). 2022 Mar 15;12(3):426. doi: 10.3390/life12030426. PMID: 35330177; PMCID: PMC8951408.