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Skin Disease Diagnosis Using Convolutional Neural Network

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Keyword:

Skin diseases, Dermatoscopic images, Deep learning and CNN(Convolutional Neural Network)

ABSTRACT

Visual similarities have made diagnosing skin illnesses more difficult for medical professionals. Although melanoma is one of the most commonly-known kind of skin illness, some fatalities in the past few years have been attributed to other illnesses. A major obstacle to developing a robust automatic classification system is the lack of huge datasets. This paper presents a deep learning method for skin cancer diagnosis. CNN were trained using transfer learning to produce classifiers that are both hierarchical and simple that are capable of distinguishing between seven distinct types of moles. In order to enhance performance, data augmentation techniques were applied to HAM10000 dataset, This has an extensive set of dermatoscopic images used in this research. Findings show that the DenseNet201 network performs well on this task, The system incorporates a CNN model to forecast the skin illness among seven different moles. In addition to that it will display the result along with information about the disease and nearby hospital recommendation.

INTRODUCTION

Because skin diseases are so contagious, they pose a serious threat to public health. It significantly affects the patient's appearance and mental health. In order to prevent them from spreading and to ensure that the identified condition receives the right care, skin disorders should be identified early on. The common causes of skin illnesses are viruses, germs, allergies, and fungi. The development of scientific and medical technologies, such as Accurate and quick skin disease identification is now feasible thanks to photonic(light waves) and lasers. The patient must make the lengthy trip to the hospital, which is its lone drawback due to its high cost. Artificial intelligence is currently being considered for the purpose of identifying skin illnesses by utilizing large data sets from hospitals and health facilities along with deep learning algorithms.

Numerous prior research investigations have been gathered, examined, and evaluated. In previous studies, the analysts have examined a few models, tools, and computations that have been useful in the categorization of skin infections. Systems have continued to rely on image processing and feature extraction techniques that support the skin condition prognosis. To employ image processing for the purpose of skin detection, we will be removing characteristics that will enable us to categorize skin conditions. Skin conditions are frequent and easily Spread because of unsuitable weather, population density, and pollution in some locations. The effort will aid in the quick, accurate, and simple

detection of skin conditions. The first step in this detection procedure is to take an image of the affected area as input, which is then analyzed to determine the disease's type. Our method only needs an infected patient's image, a camera, a computer. It doesn't require any large or expensive equipment. This method is used for feature extraction; the colour and texture of the image are the features we extract. We have processed images using CNN and classified images using AI. After completing processing, the result is shown using predict function. The goal of the effort is to employ image processing to detect seven distinct types of disorders. The conditions that are examined are mentioned bellow.

Our task is to classify skin illnesses into seven categories, which are:

[1]. Melanoma
[2]. Actinic keratoses
[3]. Vascular lesions
[4]. Basal cell carcinoma
[5]. Benign keratosis-like lesions
[6]. Dermatofibroma
[7]. Melanocytic nevi

LITERATURE SURVEY

Manual identification of skin problems through visits and consultations with dermatologists takes time. Most rural regions lack this option. These rural residents must travel to a nearby metropolis for consultation and diagnosis. This requires significant human effort. Not to mention the high cost of merely seeing your doctor. Human contact is unnecessary during the pandemic. A few diseases are infectious. The current technique requires constant bodily contact. The current computer-aided diagnostic identifies burns and injuries as skin disorders. These methods fall short of the required precision. A computer-aided method is needed to automatically identify skin illnesses and separate them from other skin concerns with good accuracy.

K. Sujay Rao and Pooja Suresh[1] examined three skin disorders. Melanoma, nevus, and seborrhoeic keratosis were correctly identified 71% of the time.Sujay Rao created, implemented and tested to categorize skin lesion image into one of five categories, a pre-trained CNN model is used to extract features from healthy, acne, eczema, benign, and malignant melanoma images. SVM classifier was employed for classification, and the overall accuracy was 86.21%. Later research utilized deep learning techniques to classify skin disorders.

Mitu Pal[2] uses pre-trained ensemble models could not beat a specialized nodule identification system, a related study. Performance gains were made possible by combining handcrafted features with CNN-based features.

Parvathaneni Naga Srinivasu et al. [5] employed deep learning-based MobileNet V2 and Long Short Term Memory to classify skin disorders. A grey-level co-occurrence matrix was utilised to evaluate illness progression. The method obtained 85% accuracy on the HAM10000 skin disease dataset.

S. Shusuke and A. Hiroyuki [6] used the CNN algorithm to train and identify several types of clinical pictures. "The works in the first section uses a pre-trained CNN as a function generator." An input image is immediately applied to the pre-trained CNN, and a specific network layer then retrieves the CNN outputs (functions). Specifically, an input image is subjected to a pre-trained CNN model, and CNN outputs are subsequently recovered from a network layer.

A.S. Zamil and H. Abdulkader[13] examined the six types of skin disease using deep learning technologies and it will classify the data with an accuracy of more that 85.8% by increasing in the layer count.

EXISTING SYSTEM:

Skin conditions are a prevalent issue that negatively affects people's lives and health. Fungal infections, bacteria, allergies, sunburn, and other factors can all contribute to skin problems. Early and correct diagnosis of the disease at a new stage can result in recovery. Machine learning (ML) is frequently employed in medicine nowadays. ML methods increase diagnostic accuracy for a variety of skin conditions. They are evaluated five types of machine-learning techniques they are: naive-bayes, KNN, SVM, random-forest classifier (RF), and Multi-layer Perception (MLP). Additionally, they employed three group techniques - bagging, boosting, and stacking to enhance the training model's efficiency, Throughout the classification step, all classifiers were attached, and then used a CNN model to obtain an accuracy of 93.3%.

PROPOSED SYSTEM:

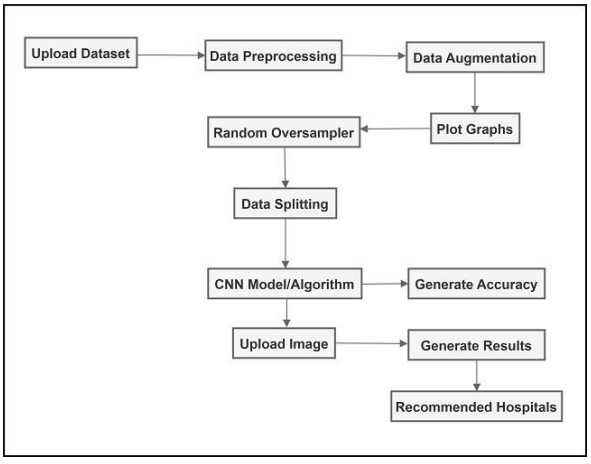

Fig-1: Block Diagram

Patients in rural places often disregard early symptoms, leading to worsening conditions over time due to a lack of medical facilities. As a result, a high-accuracy autonomous skin disease detection system is becoming increasingly essential. We have developed a multiclass deep learning model that can both classify and differentiate between different types of skin illness. We trained our model using Deep Learning, a subset of Machine Learning that utilises big datasets, resulting in significantly fewer

classifiers. The system learns, divides data into prediction levels, and delivers correct findings quickly. This promotes and supports the growth of dermatology. We employed the popular Convolutional Neural Network (CNN) technique for image classification, which achieves an accuracy of 97%.

METHODOLOGY:

A proposed system for a Skin disease diagnosis using CNN should incorporate modern technology and best practices to improve the efficiency, accessibility, and effectiveness of prediction and provides detailed information about the disease and recommendations for nearby hospitals. The methodology proposed in this paper for skin disease diagnosis involves leveraging Convolutional Neural Network (CNN) trained using transfer learning. Recognizing the challenge posed by visual similarities among skin conditions and the scarcity of extensive datasets, the researchers applied data augmentation techniques to the HAM10000 dataset, enriching it with a diverse array of dermatoscopic images. By employing transfer learning with the DenseNet201 network, hierarchical and simple classifiers capable of distinguishing between seven distinct types of moles were produced. This approach enhances the system's performance in accurately diagnosing skin cancer, addressing the need for robust automatic classification systems. Furthermore, the system not only forecasts the skin illness among the different moles but also provides detailed information about the disease and recommendations for nearby hospitals, aiming to support medical professionals in making informed decisions and facilitating prompt treatment for patients with skin conditions. Here are key components and features of a proposed system:

1. **Dataset Uploading:** The HAM10000 dataset is a collection of dermatoscopic images used for research in the field of skin disease diagnosis, particularly seven types of moles to detect. The dataset contains 10,015 dermatoscopic images, including both benign and malignant skin lesions. We have to upload the dataset to start the process after we did data preprocessing.

2. **Data Augmentation:** Data augmentation is a technique used in machine learning and deep learning to artificially increase the size and diversity of a dataset by applying various transformations to the existing data.

3. **Analysis:** Analyzing the dataset and representing it in a bar graph using data visualization techniques in python such as matplotlib and seaborn.

4. **Random Over Sampler:** Class imbalance occurs when certain classes in the dataset have significantly fewer instances than others. This can lead to biased models that perform poorly on minority classes. So, we used RandomOverSampler from imblearn module in python.

5. **Running CNN:** By using tensorflow-keras-models there is a predefined class sequential for creating a CNN model. We created a model with 20 epochs to generate good accuracy.

6. **Forecast:** Implementing a best_model.h5 file using ML modules to predict the skin disease using CNN along with it can forecast the information regarding disease and nearby hospitals.

IMPLEMENTATION:

The skin disease diagnosis using Convolutional Neural Network has the following modules:

Modules

a. Admin:

1. **Upload Dataset:** Using this module we are uploading the HAM10000 dataset into the application with the help of pandas in python.
2. **Data Preprocessing:** This module will be utilized to apply processing techniques, including removing missing values by ensuring that there are no null values in the dataset.
3. **Data Augmentation:** It is a machine learning method that expands a training dataset's size by producing modified copies of existing data using deep learning methods.
4. **Plotting graphs:** This module displays a graph displaying the frequency distribution of seven skin diseases, their count, and the age of the affected individuals.
5. **Run RandomOversampler:** This module uses random oversampling, a technique for re-sampling data by randomly selecting samples from the minority class and replacing them with new ones in the training dataset.
6. **Splitting-Data:** Dividing the dataset into test and train sets where application use 80% dataset for train and 20% dataset for test.
7. **Run CNN model:** This module is used to create a model for CNN, and CNN stands for Convolutional Neural Network. By using tensorflow-keras-models there is a predefined class sequential for creating a CNN model. We created a model with 20 epochs to generate good accuracy.
8. **Accuracy Generation:** After the completion of training the model, we make predictions on the application so that we are getting 97% accuracy.

b. User:

1. **Upload Image:** Click on upload image button then it will open a file folder in that we can choose any image from HAM10000 dataset (or) any type of skin image after that we can click on Generate disease for the given image button for next step of execution.
2. **Prediction of Skin disease:** The skin disease caused by that specific image will be predicted among the seven disease when the image is uploaded and the Prediction can be done using predict() function in Sklearn (scikit-learn) library and it will display the results as follow below:
    - □ Type of disease predicted and gives know more about the disease (info).
    - □ See nearby hospitals.
3. **Logout:** The user has the option to either leave the application or terminate the process.

RESULTS AND OUTPUT SCREENS

Fig-2: Project Interface

Fig-5: User Interface

Fig-3: Admin Page

Fig-6: Upload Histopathology image

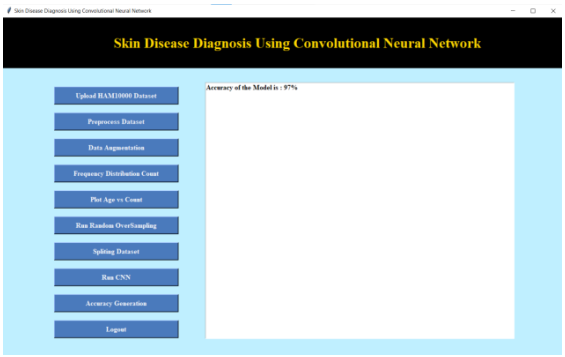

Fig-4: Generating Accuracy is 97%

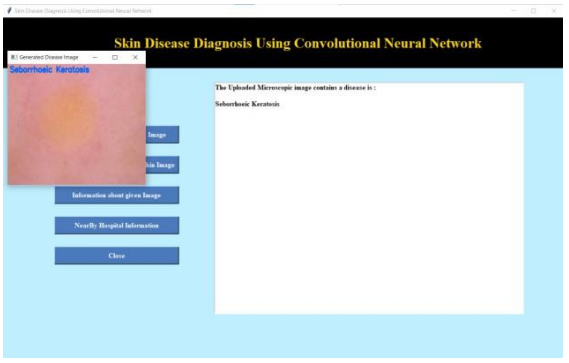

Fig-7: Predicted result of skin disease

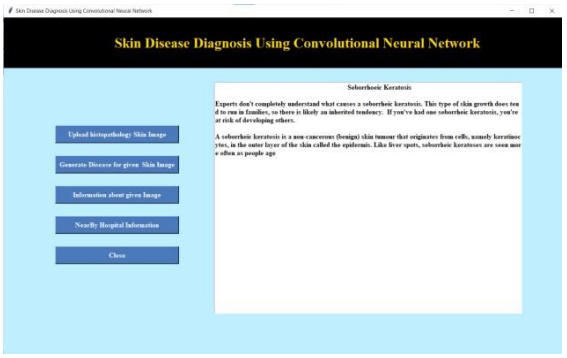

Fig-8: Information about the disease

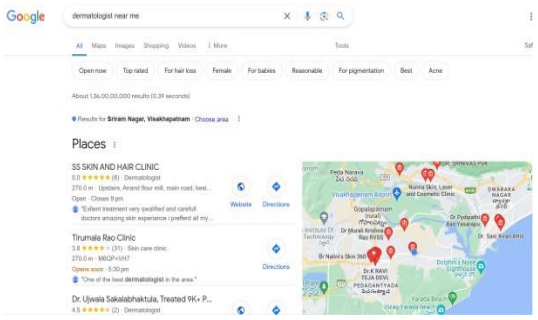

Fig-9: Nearby Recommended Hospitals

CONCLUSION:

Despite the fact that skin conditions rank as the fourth most common cause of illness, many people choose not to get medical help. We created an automatic and trustworthy system for diagnosing diseases related to the skin. Treatments for skin problems are more successful and less deforming when they are discovered early. It's crucial to remember that physicians require human judgment and intuition, so they cannot be replaced.

Our results are noteworthy because they show that it is possible to transfer information from natural photos to medical images, and Our results is to display the detailed information regarding the predicted disease with Overview, Symptoms, Risk factors & Prevention in addition to that it will display the nearby recommended hospitals.

FUTURE SCOPE:

We are developing a web based application make sure to create a mobile app so that every netizens can use our application.

1. **Enhanced Accuracy and Robustness:** Continue refining CNN architectures to achieve even higher accuracy in skin disease classification. Explore ensemble methods that combine multiple CNN models for improved robustness.
2. **Mobile Applications and Telemedicine:** Expand the deployment of skin disease detection models to user-friendly mobile apps. Integrate features like virtual consultations, appointment scheduling, and medication reminders.

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