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SKIN DISEASE CLASSIFICATION USING MATLAB

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Abstract: It is a great challenge for doctors even with the existence of emerging technology, to diagnose the symptoms of skin disease. Many people are exposed to serious skin diseases that require them to go to hospitals and go through several different expensive medical examinations which take up to days. The proposed work can solve the above problem to an extent, Here we proposed a program that can classify the skin disease, We built the Model with the help of Conventional neural network, We are using three pre-trained networks namely Alexnet, VGG16 and Resnet50.Using this model we can identify Seven diseases namely Malignant – Melanoma, Malignant - Basal Cell Carcinoma, Benign - Melanocytic Nevi, Actinic Keratoses, Benign keratosis, Dermatofibroma, Vascular skin lesions. The work is a key to detecting a range of symptoms in just a few seconds, making the diagnosis more intuitive and realistic. The aim of this project is the classification of different diseases based on image given as input. The project is based on the MATLAB software platform. The images are collected from various publicly available databases HAM100000, Dermnet, DermWeb, etc. This model improves identification accuracy and provides an interface to doctors

Introduction

Skin disorders are a significant portion of the global total of diseases, affecting millions of people worldwide. Dermatology is the medical specialty responsible for the study of more than 4,000 diseases of skin and cutaneous adnexae, accounting for 15% to 30% of outpatient medical care in health systems, incorporating a wide arsenal of diagnostic, therapeutic, and aesthetic resources.Skin diseases have been known to mankind since its origin, considering that the essentially visual component of these conditions allowed their early recognition. The first records of cutaneous nosologies date back to ancient history, when they were described by the great civilizations that shaped Western medicine. From the Egyptian papyrus emerges the first skin hygiene measures, the handling of wounds, and the use of medicinal plants. From the postulates of Hippocrates, the father of medicine, physical inspection and clinical reasoning are established as pillars of medical diagnosis. Romans, Arabs, and Byzantines protected and contributed to the development of medicine for centuries, with marked advances in the light of the Renaissance and the Illuminism.

Proposed Work

The visual performance of Humans is much better than that of computers, probably because of superior high-level image understanding, contextual knowledge, and massively parallel processing. But human capabilities deteriorate drastically after an extended period of surveillance, also certain working environments are either inaccessible or too hazardous for human beings. So for these reasons, automatic recognition systems are developed for various applications. Driven by advances in computing capability and image processing technology, computer mimicry of human vision has recently gained ground in a number of practical applications.

Image recognition refers to technologies that identify places, logos, people, objects, buildings, and several other variables in digital images. It may be very easy for humans like you and me to recognize different images, such as images of animals. We can easily recognize the image of a cat and differentiate it from an image of a horse. But it may not be so simple for a computer. A digital image is an image composed of picture elements, also known as pixels, each with finite, discrete quantities of numeric representation for its intensity or grey level. So the computer sees an image as numerical values of these pixels and in order to recognize a certain image, it has to recognize the patterns and regularities in Image recognition should not be confused with object detection. In object detection, we analyze an image and find different objects in the image while image recognition deals with recognizing the images and classifyingthem into various categories.

Convolutional Neural Networks

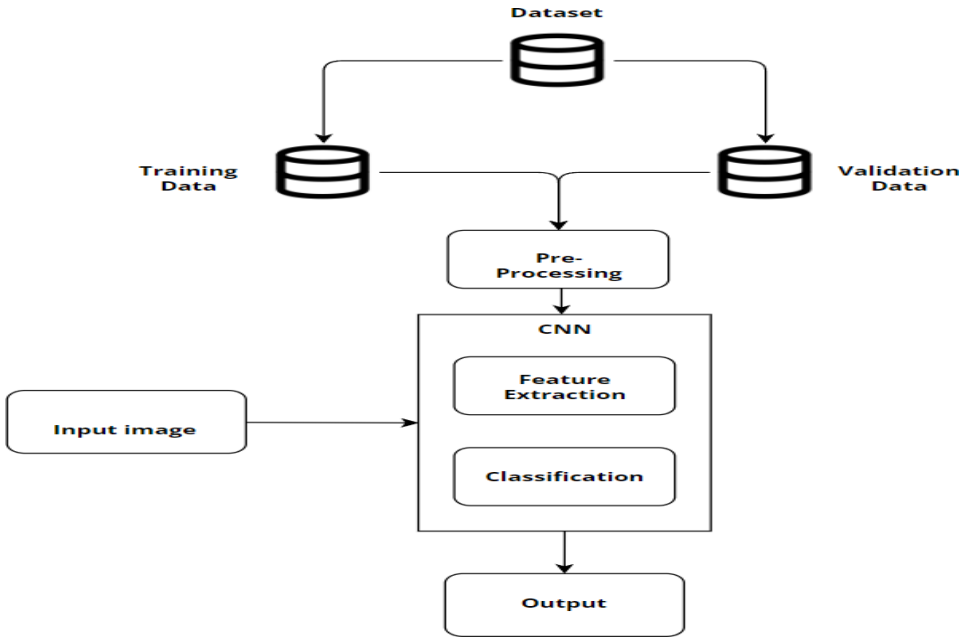
Convolutional Neural Networks (CNNs) have proven to be very successful frameworksfor image recognition. In the past few years, variants of CNN models achieve increasingly better performance for object classification.

Transfer Learning

Humans have an inherent ability to transfer knowledge across tasks. What we acquire as knowledge while learning about one task, we utilize in the same way to solve related tasks. The more related the tasks, the easier it is for us to transfer, or cross-utilize our knowledge. Conventional machine learning and deep learning algorithms, so far, have been traditionally designed to work in isolation. These algorithms are trained to solve specific tasks. The models have to be rebuilt from scratch once the feature-space distribution changes. Transfer learning is the idea of overcoming the isolated learning paradigm and utilizing knowledge acquired forone task to solve related ones.

Block Diagaram

The proposed system can classify the type of Skin disease using three Conventional Neural Network Models Alexnet, Vgg16, Resnet50, It can classify seven diseases.



Pre-processing

In this stage we take the data from data set and arrange the data according to the classes, as the data comes from different sources the dimension of the data may vary so first we take each image from dataset and change its dimension as we required. For this we are using IMRESIZE function for changing the dimension of the image this process is followed as well as to the input image.

Data Augmentation

Dataset augmentation is the process of applying simple and complex transformations like flipping or style transfer to your data can help overcome the increasingly large requirements ofDeep Learning models

- Flipping (both vertically and horizontally)
- Rotating
- Zooming and scaling
- Cropping
- Translating (moving along the x or y axis)
- Adding Gaussian noise (distortion of high frequency features)

CNN Models

we are classifying the skin diseases using Three CNN models, this models are available in MATLAB just we need to install them and using transfer learning technique we are modifying the models according to our dataset and our requirement.

AlexNet

AlexNet was primarily designed by Alex Krizhevsky. It was published with Ilya Sutskever andKrizhevsky's doctoral

advisor Geoffrey Hinton, and is a Convolutional Neural Network or CNN. AlexNet is a convolutional neural

network that is 25 layers deep. You can load a pretrained version of the network trained on more than a million images from the ImageNet database. The pretrained network can classify images into 1000 object categories, such as keyboard, mouse, pencil, and many animals. As a result, the network has learned rich feature representations for a wide range of images. The network has an image input size of 227-by- 227.

Vgg16

VGG stands for Visual Geometry Group it is a standard deep Convolutional Neural Network (CNN) architecture with multiple layers. The "deep" refers to the number of layers with VGG- 16 or VGG-19 consisting of 16 and 19 convolutional layers.

The VGG model, or VGG Net, that supports 16 layers is also referred to as VGG16, which is a convolutional neural network model proposed by A. Zisserman and K. Simonyan from the University of Oxford. These researchers published their model in the research paper titled, "Very Deep Convolutional Networks for Large-Scale Image Recognition."

Resnet50

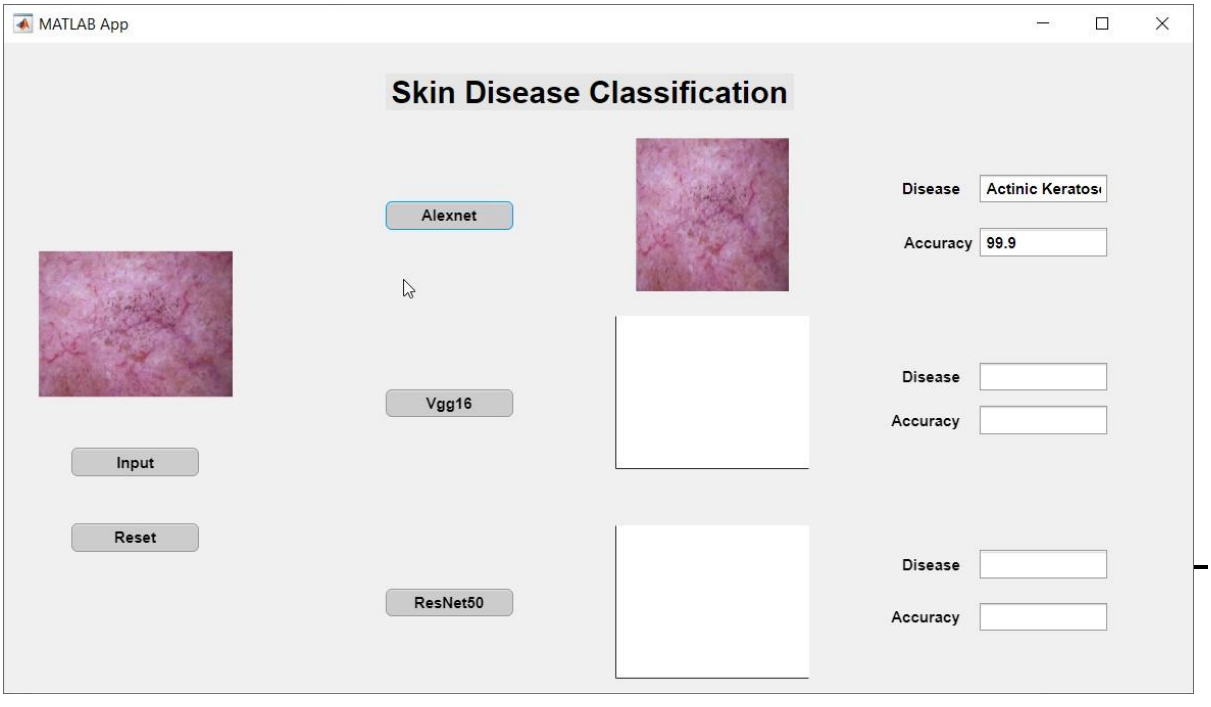
ResNet-50 is a convolutional neural network that is 50 layers deep. You can load a pretrained version of the network trained on more than a million images from the ImageNet database. The pretrained network can classify images into 1000 object categories, such as keyboard, mouse, pencil, and many animals. As a result, the network has learned rich feature representations fora wide range of images. The network has an image input size of 224-by-224

In this we are using 177 Layer Architecture The first thing we note in the above diagram is that there is a direct link that skips several of the model's levels. The skip connection,' as it is known, lies at the core of residual blocks. Because of the skip connection, the output is not the same. Without the skip connection, input 'X is multiplied by the layer's weights, then adding of a biasterm.

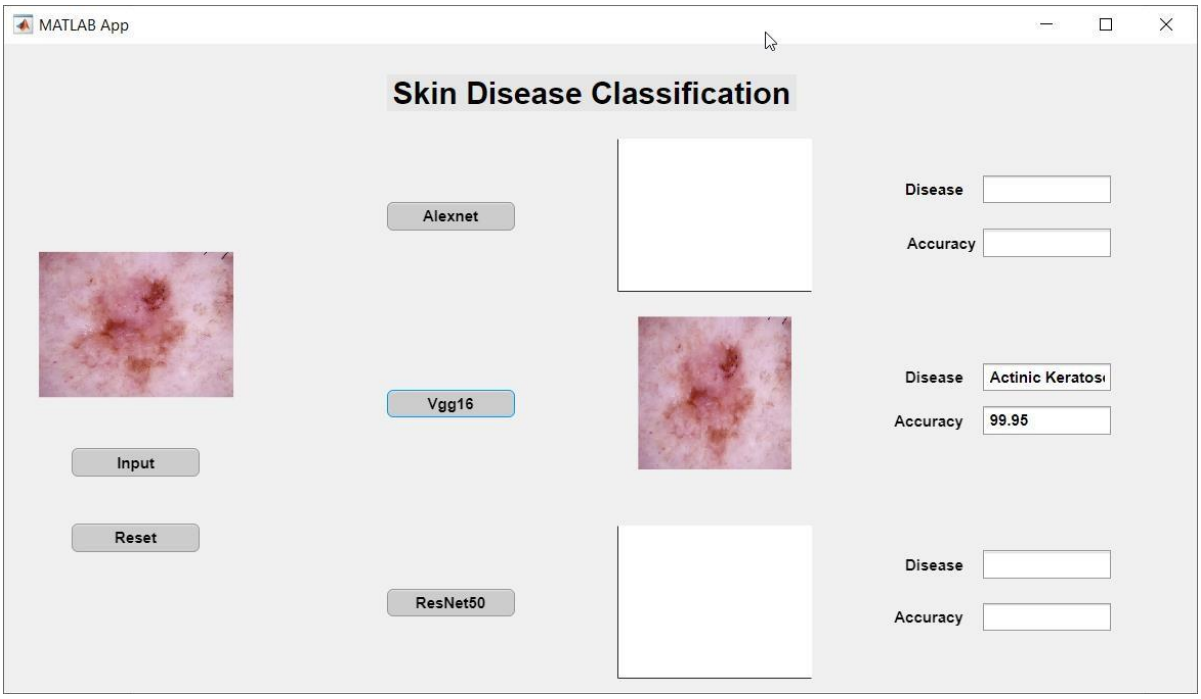
Results

We are using app designer for creating a GUI interface, so that everyone can use this easily. In this system we are using three network models so we can classify a disease in different network models prefer to one or we can classify with all of them.

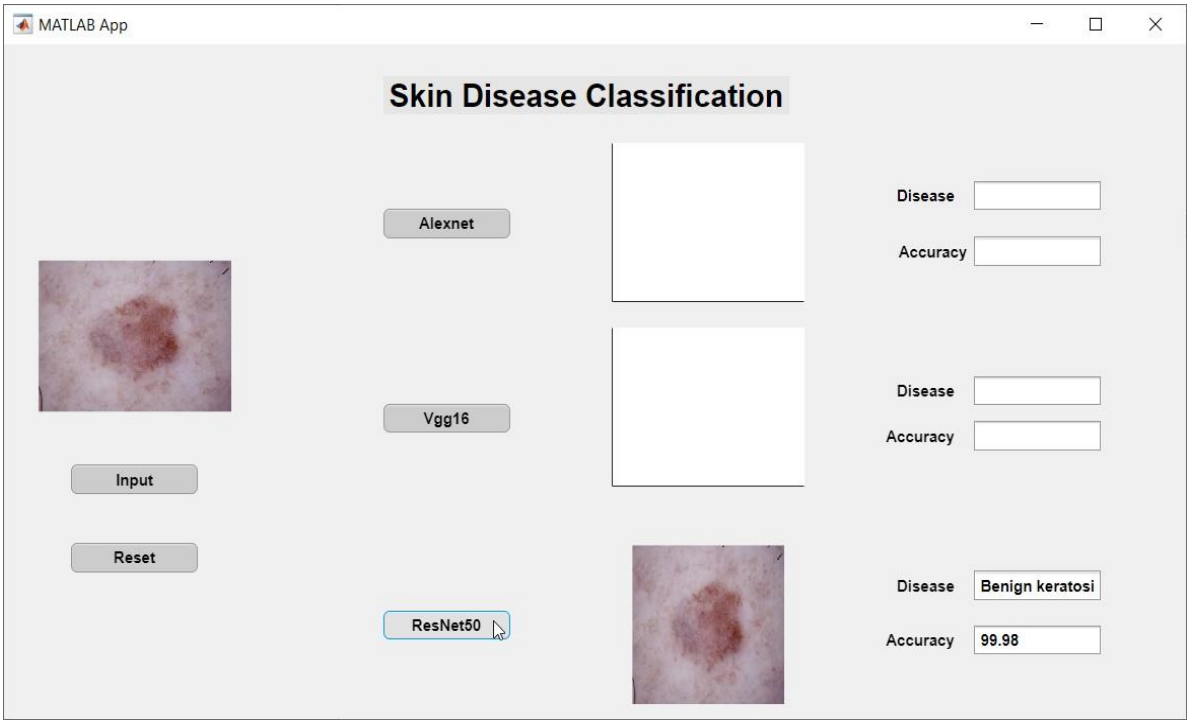
Classify using alexnet



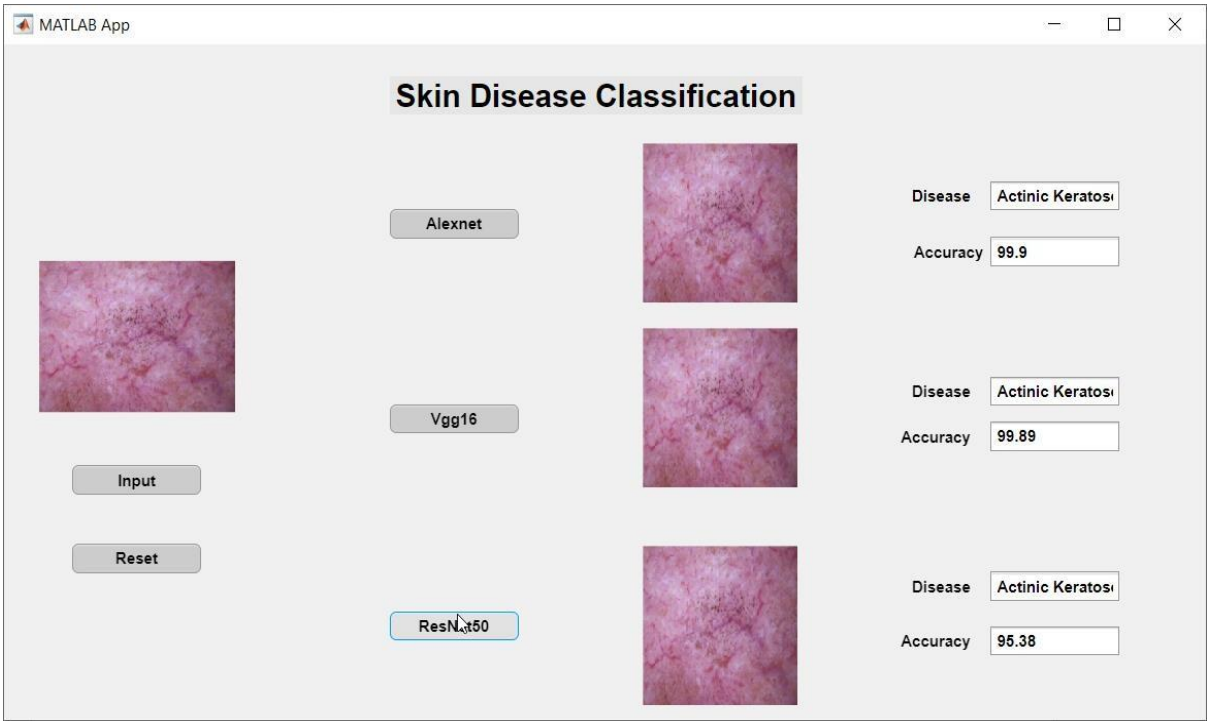
Classify using vgg16



Classify using resnet50



Classifying using three models



Advantages

- This help to common people who effect with skin problem
- Using this we can classify seven diseases
- Easy to use
- The whole project is based on MATLAB only. So no external components needed
- We can classify Diseases with different CNN models

Conclusion

The feasibility of building a universal skin disease classification system has been investigated using CNN, Resnet, Alexnet and VGG16. CNN has outperformed over training data but not on testing data. Better accuracy can be obtained by providing a training set with more variance and also by increasing its size. It is also found that Resnet has given better accuracy comparedto other networks in the diagnosis of skin diseases

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