A Review on Novel Approach for Skin Cancer Detection

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Abstract

Skin cancer is the uncontrolled growth of abnormal cells in the epidermis (outermost skin layer) caused by damaged DNA that triggers mutations these mutations lead the skin cells to multiply rapidly and form malignant tumors. Diagnosis of an unknown skin lesion is crucial to enable proper treatments. While curable with early diagnosis, only highly trained dermatologists are capable of accurately recognize melanoma skin lesions. Expert dermatologist classification for melanoma dermoscopic images is 65-66%. As expertise is in limited supply, systems that can automatically classify skin lesions as either benign or malignant melanoma are very useful as initial screening tools. Towards this goal, this study presents a convolutional neural network model, trained on features extracted from a highway convolutional neural network pre-trained on dermoscopic images of skin lesions. This requires no lesion segmentation nor complex preprocessing. Further, it doesn't cost much computational power to train the model. This proposed approach achieves a favorable training accuracy of 98%, validation accuracy of 64.57% and validation loss 0.07 in the model with 46% sensitivity and 64% classification accuracy in testing data. Artificial Perspicacity and machine learning both technologies have proved that nothing is infeasible to find if we are living in the world of technologies.

Introduction

Skin Cancer is one of the most common healthcare diseases found in humans. It's estimated that the number of new melanoma cases diagnosed in 2022 decrease by 4.7%. The number of melanoma deaths is expected to increase by 6.5% in 2022. The vast majority of melanomas are caused by sun. Skin cancer develop primarily on area of skin including scalp, face, lips, auditory perceivers, neck, chest, arms, hands, and on the legs and also on palm, beneath your finger nails, genetal area or toe-nails, in humans.

On average a persons for melanoma doubles if they had more than 5 symbols. Skin cancer including, both malignant melanoma and non-melanoma skin cancer(NMSC), are common cancer and their incidence is on the rise[2]. Carcinoma is caused by unrepaired polymer (DNA) in skin cells that generates genetic mutations on the skin. Lesions parameters like symmetry color, size, shape, etc. Square major accustomed sight carcinoma and to differentiate benign carcinoma from skin cancer.

digital imaging has become a favored method for medical diagnosis with modern computation power and machine learning methods. Nowadays, various deep learning models have been created and applied in the field of medical diagnosis due to them to recognize patterns in digital images (Cicero, Oliveira, Botelho, & da Computaçao, 2016). Currently the best- performing technique for image classification is convolutional neural networks (CNNs). By itself, CNNs have led to breakthroughs in many medical image analysis tasks such as classification and detection of illnesses. For example, CNN models have been used to classify malignant and benign lesions from dermoscopy images of human skin (Nasr-Esfahani et al., 2016). In the United States Skin cancer is far the most common form of cancer. Melanoma is the deadliest form of skin cancer caused by abnormal multiplication of pigment producing cells that give color to the skin (Nasr-Esfahani et al., 2016). In accord with the American Cancer Society's estimations for 2017, there are about 87,110 new melanoma cases that will be diagnosed, and about 9,730 people are expected to die of melanoma (American Cancer Society, "Key Statistics for Melanoma Skin Cancer, 2017"). As the percentage of melanoma has dual and enlarge at a faster rate than any other types of cancer, it has become a major public health threat not only in the United States, but also globally. Early diagnosis is a critical issue when fighting this disease, and it allows for more treatment options. Nowadays more sophisticated equipment and highly trained professionals are needed for precise and early

detection of melanoma. Dermoscopy is a specialized technique for obtaining high-resolution magnified images of the skin, by controlling light and removing surface skin reflectance.

Literature Review

According to Vijayalakshmi M et al.[1]

Our model is designed in three phases which include data amassment and augmentation, model designing, and conclusively presage. Fatal diseases such as melanoma diagnosed at an early stage play a great role in determining the chances of recuperation. We believe that the application of automated methods will avail in early diagnosis, especially with the set of images with diagnoses of different nature. They have used image processing and machine learning in their research to classify skin cancer she used CNN algorithm and have utilized several artificial intelligence algorithm (CNN), support vector machine and amalgamated this with image processing implements to engender better structure, achieving high precision of 85%.

Praveen Bansode et al. [2]

The purpose of this work is to detect skin cancer people are able to know what kind of disease they are getting affected and what precautions and treatment should be taken at an early stage and it will help to prosperously treat the disease. The main reasons for Skin cancers are air pollution, UV radiation, and an insalubrious lifestyle. The mostcommonly used relegation algorithm is the Support Vector Machine (SVM). First, we analyses the skin image and then convert the images to BGR-Gray and BGR-HSV to enable the computer to understand and read its binary code. The aim of this study is to treat disease at the initial stage.

Mario Fernando Jojoa Acostaet al.[3]

This method consists of two fundamental stages, stage 1: Filters regions within the image that may contain a skin lesion in order to be relegated. In Stage 2, in order to relegate the cropped images identified as skin lesions from Stage 1, we decided to include a ResNet152 classifier that outputs a benign or malignant label. A "malignant" class is understood as referring to those skin lesions identified as melanoma and a "benign" class refers to all those lesions not identified.

Neema M et al. [4]

There are approximately 200 variants of cancer. Melanoma is the deadliest form of skin cancer, with a mortality rate of 1 in 200 as given Clinical screening is followed by dermoscopic analysis and histological testing in the diagnosis of melanoma. Dermatologists utilize a high-speed camera to take dermatoscopic images of skin lesions, concurrently, the machine-valid approach to cancer detection is more efficient. Deep learning is a type of artificial astuteness that mimics the human encephalon's competency to organize data and engender patterns for decision-making. In this paper, we will discuss building a one-of-a-kind deep learning architecture fixated on the early detection of skin cancer. Total accuracy of this model is 75%-84%. The goal of the project is to engender an automated system.

METHODOLOGY

In this proposed system, skin cancer is detected with the help of CNN algorithm and HAM1000 dataset. The process is mentioned below in flowchart.
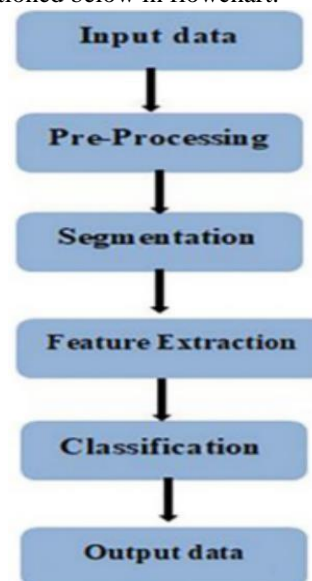
Stage I: Firstly, a sample image is given as raw input to the system to start the detection process.

Stage II: Now in the second stage the pre-processing of images starts. Pre- processing is a data mining technique to convert the raw data to a useful one so that other operations like feature

extraction, classify and pooling can be performed easily. In this technique, the data cleaning, integration, reduction, and transformation is done.

Stage III: Now after the pre-processing, the image is sent for the segmentation process where a real image is divided into subgroups to find the peak value helps reduce the image's complexity to make further processing or analysis simpler.

Stage IV: In this stage feature extraction of the image is done. As feature defines the behavior of the image and it is used in many image processing techniques. It is better performed using CNN.

Stage V: Now the final stage is image classification where several classes belonging to the same class of the provided image are intended into a digital image. It helps in differentiating similar features of the image.

Stage VI: Finally, after going through all the above stages the resulting image comes out with the expected result of cancer detected or not and if detected then to which type of skin cancer it belongs to is found.
Support vector machine

Support Vector Machine (SVM) is a widely used supervised machine leaning algorithm generally utilized for relegation and regression

processes. It utilizes a technical trick Kennedy as the kernel trick in which a boundary line is drawn between the relegated images or videos to make them separate and find precision between them. According to study, this algorithm provides a higher range of precision when performed in curlier detections but the disadvantage of utilizing this algorithm is that it only gives precision on diminutive datasets and selective areas. When it comes to sizably voluminous datasets the algorithm fails to provide precision. Therefore, the result of utilizing SVM is found to be 70% precise.

CNN: CNN is a widely used deep neural network algorithm that pietism two-layer operations on input data. Operations on images and videos are done by CNN as it has a specialization in image processing. The architecture of CNN shown in figure 5, consists of multi-layer architecture that is ReLU activation layer, feature extraction layer, activation polling, and plenarily connected layer with SoftMax activation as relegation layer.
Polling layers within the CNN methodology conventionally are inserted typically once many convolutions' layers. There are many benefits of the pooling layer, which may more and more minimize the size of the output volume on the Feature Map in order that it will manage over-fitting The pooling layer is employed to reduce knowledge utilizing max-pooling or mean Pooling.
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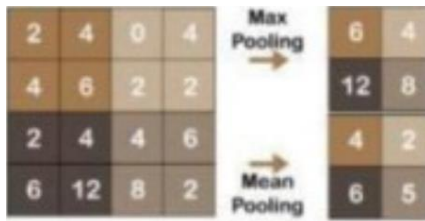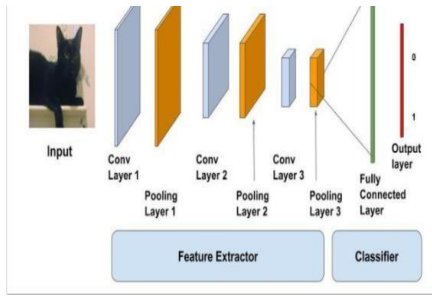
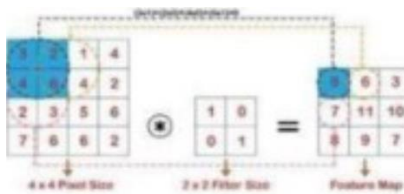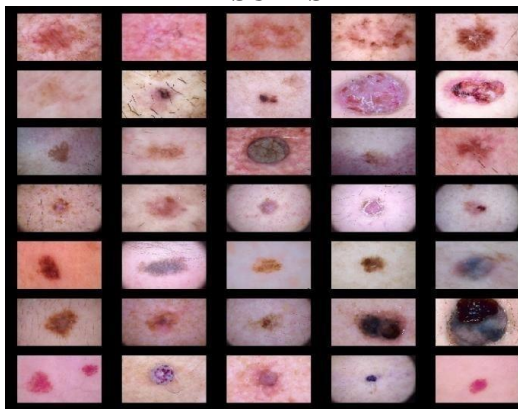Fig. 7 Pooling Process Illustration

Fig. 6 Illustration of the convolution process

RESULTS

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