International Journal of Advances in Engineering and Management (IJAEM)
Volume 4, Issue 7 July 2022, pp: 1261-1264 www.ijaem.net ISSN: 2395-5252

Skin Cancer Detection Using Machine Learning

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Submitted: 10-07-2022 Revised: 18-07-2022 Accepted: 23-07-2022

ABSTRACT
Skin cancer is a type of cancer that grows in the skin tissue, which can cause damage to the surrounding tissues, disability, and even death. The necessity of early diagnosis of skin cancer has been increased because of the rapid growth rate of Melanoma skin cancer, its high treatment costs, and death rate. The cancer cells are detected manually and require a large amount of time and cost. This paper proposes a machine learning based skin cancer detection and classification application by processing of images. The features of the affected skin cells are extracted and studied based on which the cancer is classified. An application to help do the classification without having to wait a large amount of time and with higher accuracy is proposed.

Keywords: Machine Learning, Skin Cancer, Convolutional Neural Network, Skin cancer Classification

I. INTRODUCTION

Skin cancer is the out-of-control growth of abnormal cells in the epidermis, the outermost skin layer, caused by unrepaired DNA damage that triggers mutations. These mutations lead the skin cells to multiply rapidly and form malignant tumors. The two main causes of skin cancer are the sun's harmful ultraviolet (UV) rays and the use of UV tanning beds.

The earlier the detection, the easier the curing, but only a well trained and experienced specialist can diagnose skin cancer that early. There is a huge shortage of experts and tools that can do the diagnosis accurately. To overcome this computer-aided systems are brought into the field.

In this paper, an application for detecting the type of skin cancer using Machine Learning is used. The training of the model is done using the CNN algorithm.

The features of the images are extracted and studied to classify them into different type of skin cancer as trained.

The application developed allow a doctor or patient to login, upload the image and detect whether there is cancer or not and what type of cancer it is, if any.

II. RELATED WORKS

The diagnosis of the skin cancer is mainly done by a dermatologist where they access the images of cancer patients and analyze the result whether the patient has cancerous cells or not. Because of having cancerous cells, dermatologist suggest it as malignant melanoma and benign on vice versa. The issue with this is, it requires a lot of time to process a ton of patients and furthermore it takes a great deal of labor to expand the rate of recognition which makes the cost go up. The developing computerized system can automate this skin cancer detection process that will assist the dermatologists, and makes their works easier and faster. Various methods or techniques have been developed for to make the skin cancer diagnosis. A closed elastic curve technique along with intensity threshold method was proposed in Segmentation of skin cancer images in 1999 by A. Goshtasbya, D. Rosemanb, S. Binesb, C. Yuc, A. Dhawand, A. Huntleye, L. Xua and M. Jackowskia to detect the skin lesion boundary accurately. Robert Amelard et al. in 2014.

Melanoma Decision Support Using Lighting- Corrected Intuitive Feature Models. Computer Vision Techniquesfor the Diagnosis of Skin Cancer, Series inBio Engineering (2014) have suggested an illumination correction and feature extraction framework based on high level intuitive feature implemented on skin images. Some others have proposed an artificial neural network approach with Back-propagation neural network

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(BNN) and Auto- associative neural network. A method dependent on ABCD standard to recognize skin malignant growth was proposed. At this method 'E' is not implemented in ABCD rule which is performance increasing method. Some authors have proposed a system which recognizes dangerous melanoma skin malignant growth by removing special highlights through 2D wavelet change. At that point, the resultant picture is given as contribution to fake neural system classifier.

III. PROPOSED METHOD

Currently, to check whether a person has skin cancer or not they have to approach a dermatologist who in turn send the patient for a series of tests like biopsies, results of which is used for providing a proper diagnosis. The proposed method uses the CNN to train the machine and predict if the patient is having cancer or not from the image of the problem area.

Convolutional Neural Network (CNN)

CNNs are a supervised learning method and are therefore trained using data labeled with the respective classes. Essentially, CNNs learn the relationship between the input objects and the class labels and comprise two components:

- the hidden layers in which the features are extracted and, at the end of the processing,
- the fully connected layers that are used for the actual classification task.

Unlike regular neural networks, the hidden layers of a CNN have a specific architecture. In regular neural networks, each layer is formed by a set of neurons and one neuron of a layer is connected to each neuron of the preceding layer. The architecture of hidden layers in a CNN is slightly different. The neurons in a layer are not connected to all neurons of the preceding layer; rather, they are connected to only a small number of neurons.

This restriction to local connections and additional pooling layers summarizing local neuron outputs into one value results in translation-invariant features. This results in a simpler training procedure anda lower model complexity.

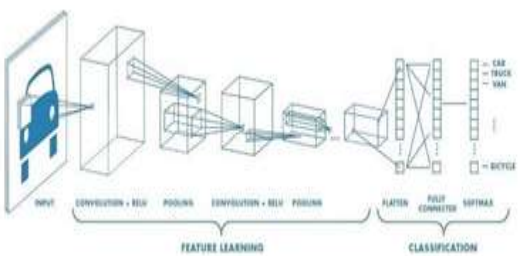

Figure 1. Convolutional Neural NetworkProcess

The following steps are used to detect whether the given dermo-scopic image has cancer or not:

Step 1: Initializing all the images and all the parametersthat are needed for system.

Step 2: The system takes a training image as input andsaves the images into the system.

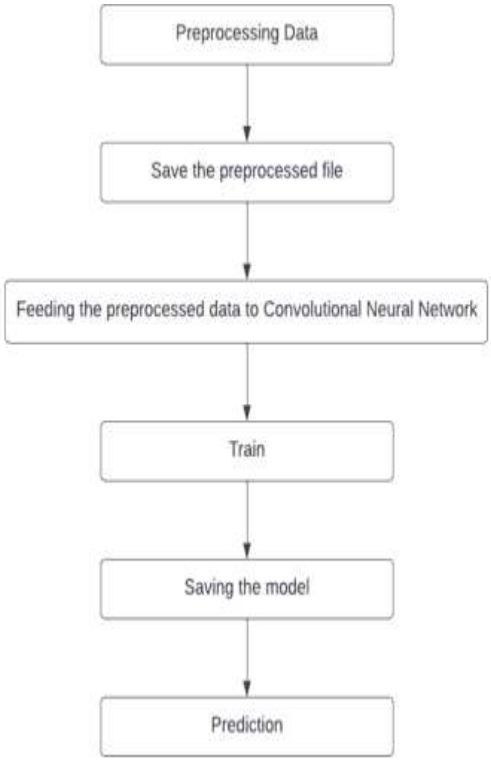

Figure 2. Flow chart for the system using CNN

Step 3: The system uses convolutional neural networkand finds out the prediction.

Step 4: Training with the convolutional neural networkthat are generated in step 3.

Step 5: Save the model into the system for prediction ofthe test data.

Step 6: Evaluate the result with the standard evaluation metrics like accuracy, precision, recall, and f1 score

IV. EXPERIMENTAL SETUP

Data Set

Approximately 8222 images are collected from ISIC Archive. These images are used to predict cancer.

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Figure 3. Images of skin tissues with cancer

Figure 4. Image of skin tissues with no cancer

Performance Metrics

A classifier assigns each object to a class. This assignment is generally not perfect and objects may be assigned to the wrong class. To evaluate a classifier, the actual class of the objects must be known. To evaluate the classification quality, the class assigned by the classifier is compared with the actual class. This allows the objects to be divided into the following four subsets:

1. True positive (TP): the classifier correctly predicts the positive class.
2. True negative (TN): the classifier correctly predicts the negative class.
3. False positive (FP): the classifier incorrectly predicts the positive class.
4. False negative (FN): the classifier incorrectly predicts the negative class.

To assess the model, accuracy, recall, precision, specificity and f1 score are utilized to determine the performance of proposed model.

$$\text{ACCURACY} = \frac{TP+TN}{TP+FP+TN+FN} \quad (1)$$

$$\text{RECALL} = \frac{TP}{TP+FN} \quad (2)$$

$$\text{PRECISION} = \frac{TP}{TP+FP} \quad (3)$$

$$\text{SPECIFICITY} = \frac{TN}{TN+FP} \quad (4)$$

$$\text{F1 SCORE} = \frac{2*(RECALL*PRECISION)}{RECALL+PRECISION} \quad (5)$$

Technology

The proposed system is developed using html, css and js as front-end tool and MySQL as database. Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. MySQL is a freely available open source relational database management system and python is the back end of the project which is connected using Djangoframework.

V. RESULT AND DISCUSSION

The proposed project of skin cancer detection using CNN gives an accuracy of 89% with 10 Epochs.

With a more efficient machine with higher specifications, the model can be trained to have more accuracy.

The project can be developed by Integrating AI to it for making the project intelligent and act like a medium between the doctor and the patient by booking appointments and health and treatment schedules for the infected people.

VI. CONCLUSION

In this project, a CNN based approach of predicting the cancer is developed. A front end is created to make the application easy to use. The front- end allows a person to login and classify the skin lesion by uploading the photo of the problem area. A list of cancer treatment centers is given. The project provides an easy and accessible way to predict skin cancer.

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