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Melanoma Cancer Detection using Image Processing

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Abstract - *Melanoma is the most lethal type of skin cancer in the world. Several attempts have been made to detect melanoma early using deep learning techniques based on dermoscopic images. For an accurate diagnosis of melanoma, it is important to distinguish complex lesion patterns. The typical lesion patterns, on the other hand, are not consistently present, resulting in sparse labelling issues in the results. We suggest a multi-tasking system in this paper.*

***KeyWords*:** opencv, feature extraction, image preprocessing, CNN algorithm etc.

1. INTRODUCTION

The skin is the body's largest organ. The skin protects us from pathogens and the elements, assists in body temperature regulation, Skin has three layers. The epidermis, or outermost layer of skin, Tough connective tissue, hair follicles, and sweat glands are found under the epidermis in the dermis .The hypodermis (deeper subcutaneous tissue) is made up of fat and connective tissue. Melanocytes are cells that live in the epidermis' deepest layer, just above the dermis. Melanocytes are the cells that contain the pigment or colour of the skin. Melanoma is a cancerous tumour that develops when healthy melanocytes shift and grow out of control. Skin cancer is one of the most common cancers globally, and every year in the United States, more than one million skin cancers have been diagnosed. Melanoma, which causes over 9,000 deaths annually, is the most dangerous type of skin cancer.

Cancer is now one of the most widespread causes of death. Uncontrolled development of irregular cells is called cancer. There are a number of cells in the human body. There are normal cells derived from DNA. Again these normal cells break into other normal cells. There may be a defect in the DNA because of some problem. There are more than 100 distinct cancer types of which the most dangerous disease is skin cancer. A vast number of patients have skin cancer. Because of the fast growth of irregular skin cells, skin cancer causes skin tumours. Deep learning, especially the convolutionary neural network (CNN), such as VGG [3], U-Net [4] and Mask R-CNN [5], has been widely used to address many computer vision problems. Models of deep learning were also applied to identify skin diseases.

2. OBJECTIVE

The objective of also this project use for melanoma cancer detection using image processing their ultimate objective is to improve DSS's overall decision support capability. The purpose of this paper is to use texture knowledge only for the classification of skin lesions:

RELATED WORK OR LITERATURE SURVEY

[1] "A Study on Melanoma Skin Cancer Detection Techniques"
Author: Ms. Amulya P M

Both supervised and unsupervised classification are performed in the paper by Mhaskeet.al[11]. The supervised learning based classifiers are neural networks and support vector machines, while the unsupervised learning based classifier is the K-means clustering algorithm. The accuracy of the result is compared to the accuracy of these various classifiers. Using Support Vector Machine, they were able to achieve high accuracy. The accuracy of the K-means clustering algorithm is lower than the accuracy of the Neural Network and Support Vector Machine algorithms.

[2] A Method for Melanoma Skin Cancer Detection Using Dermoscopy Images

Author: Soniya Mane, Dr. Swati Shinde.

The dataset's original colour skin image is chosen in this process. An original colour skin image is chosen and transformed to a grayscale image. The skin picture includes several hairs, which will reduce classification accuracy. As a result, hair removal is necessary. The Gaussian filter is used to remove the hair.

[3] A Color-Based Approach for Melanoma Skin Cancer Detection
Author: Shalu, Aman Kamboj

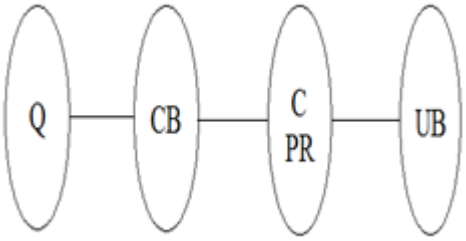
A method for detecting melanoma skin cancer is developed in this paper. To begin, various preprocessing and segmentation techniques were used to enhance the image and extract the region of interest. KNN classifier, Decision Tree, and Nave Bayes classifier In contrast, the Decision Tree classifier achieves an accuracy of 82.35 percent, which means that it outperforms the other classifiers. Since the evolved system's precision is higher than its sensitivity, it correctly recognizes benign cases..

[4] LESION ATTRIBUTES SEGMENTATION FOR MELANOMA DETECTIONWITH MULTI-TASK U-NET

Author: Eric Z. Chen, Hongda Jiang

We only used the performance likelihood from the segmentation task for prediction in this paper. The classification task's performance probabili-ties may also be used. This may be a way to boost the efficiency of our proposed model, and it's worth exploring further. In the encoder portion of the U-Net, other pre-trained networks may be used. We also tried the Dense Net that had been pre-trained. However, the final result was worse than with VGG16 as the encoder due to the high GPU memory consumption and slow training speed.

2. MATHEMATICAL MODELING



Where,
Q = User entered input
CB = pre-process
C = apply classifier algorithm
PR = pre-process request evaluation
UB = response

Set Theory
1) Let S be as system which input image
S = {In, P, Op, Φ}
2) Identify Input In as
In = {Q}
Where,
Q = User entered input (text)
3) Identify Process P as
P = {CB, C, PR}
Where,
CB = Pre-process
C = apply classifier algorithm
PR = Pre-process request evaluation
4) Identify Output Op as
Op = {UB}
Where,
UB = Predict outcome
Φ =Failures and Success conditions.

Failures:
1. Huge database can lead to more time consumption to get the information.
2. Hardware failure.
3. Software failure.

Success:
1. Search the required information from available in Datasets.
2. User gets result very fast according to their needs.

Space Complexity:
The space complexity depends on Presentation and visualization of discovered patterns. More the storage of data more is the space complexity.

Time Complexity:
Check No. of patterns available in the datasets= n
If (n>1) then retrieving of information can be time consuming. So the time complexity of this algorithm is $O^{(n^n)}$.
Above mathematical model is NP-Complete.

Algorithm:

CNN:

A Convolutional Neural Network (ConvNet/CNN) is a Deep Learning algorithm which can take in an input image, assign importance (learnable weights and biases) to various aspects/objects in the image and be able to differentiate one from the other. The pre-processing required in a ConvNet is much lower as compared to other classification algorithms. While in primitive methods filters are hand-engineered, with enough training, ConvNets have the ability to learn these filters/characteristics.

How CNN works:
- Convolution
- Relu layer
- Pooling
- Fully connected

The convolution of f and g, written as f∗g, is defined as the integral of the product of the two functions after one is reversed and shifted:

$$s(t) = \int x(a)w(t-a)da \qquad s(t) = (x * w)(t)$$

Convolution is commutative. Can be viewed as a weighted average operation at every moment (for this w need to be a valid probability density function).
Discrete Convolution (one-axis):

$$s[t] = (x * w)(t) = \sum_{a=-\infty}^{\infty} x[a]w[t-a]$$

Convolution and Cross-Correlation in Images
Convolution operator: G=H*F

$$G[i,j] = \sum_{u=-k}^{k} \sum_{v=-k}^{k} H[u,v]F[i-u,j-v]$$

Existing system and disadvantages

In existing system there is no computerizes system to identified the human query. Firstly, it is only suitable for the instance-level approaches that require an instance classifier, As we mentioned before, existing popular approaches of use with neural networks are treat separated instances as inputs, then use a deep neural network to transform them into embedding space.

Advanced system and advantages

The proposed system would help replicate the customer service experience with one difference that the customer would be interacting with a virtual trail room instead of a real person and yet get the queries attended and resolved.

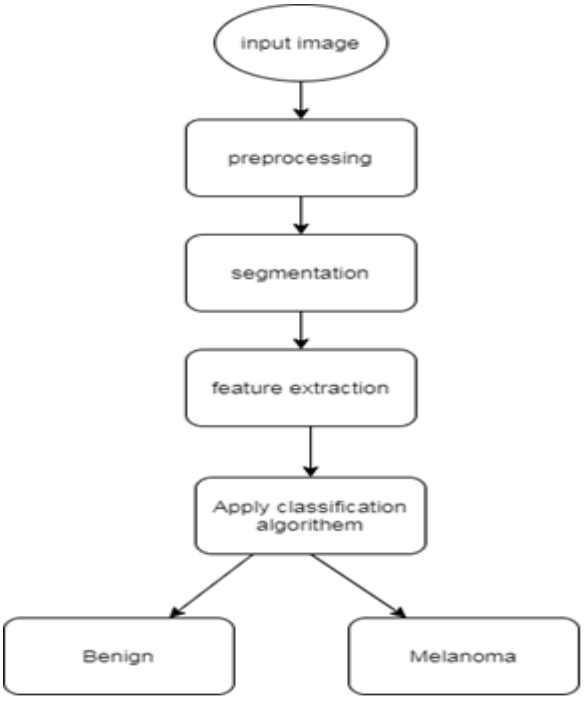


Figure: Advance System Architecture

Step1: User select the clothes
Step2: Then apply data pre-processing
Step3: Then after extract the feature of clothes using cascaded classifier
Step4: apply CNN algorithm and train the model
Step5: then after load the model and given input model predict the virtual clothes.

Advantages:

1. Secure and efficient system.

CONCLUSION

This paper demonstrates an effective tool for detecting skin cancer. This technology uses computer-assisted diagnosis to diagnose skin cancer. Manually detecting skin cancer is a time-consuming and boring process. Biopsy is a traditional technique for detecting skin cancer. This procedure involves scraping a portion of a suspected lesion and sending it to a lab for examination. As a result, this procedure is invasive, painful, and time-consuming. As a result, computer-assisted diagnosis is needed to address the aforementioned issues. The skin image is pre-processed in this method, and then segmentation is performed.

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