Detection of Melanoma through Machine learning with high precision for accuracy

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Abstract: Melanoma is a form of skin cancer if detected earlier can be cured. Melanoma appears on skin as large mole or spot, which varies in colour and shape. Clinical diagnosis which involve ABCDE where A is the asymmetric shape of mole, B is border of mole which is blurred, C is colour of mole, D is diameter which determines size and E stands for evolving growth on skin layer. Use of Machine learning in dermatologist practice for detection of melanoma gives a prominent result. With advances in technology, computer vision images of melanoma are scanned and are classified with help of machine learning algorithms for specific determination of spot or mole to be melanoma or not. The features explored include colour, shape, size and elevation above skin which can be captured with computer vision. This prior detection helps for early cure for melanoma.Choosing the right algorithm and to understand the algorithm formula, tuning your algorithm for accuracy, optimization, time efficiency, process parameters in a given data set and model complexity. To predict melanoma skin cancer in early time we can use CNN as of which will give more accuracy.

Keywords:
Classification, Support Vector Machine, Convolutional Nueral Networks , Melanoma, Machine Learning

1. Introduction

Recently CNNs are with major contribution in image processing applications. CNNs became more popular among the researchers as it takes raw data, without any pre processing. Feature extraction and classification stages are conducted in a single frameworks so that CNNs are faster. In this paper we have presented application which will detect skin cancer melanoma in eary stages which will help in diagnosis of patient. It will reduce cases of death due skin cancer melenoma. [1] The skin contributes as a largest organ of body. Skins function includes to protect the inner organs of body and to regulate the temperature oof body. It also protects against injury and infection. The Skin is storage to ample of water and fat.Layers of skin are, uppermost layer as epidermis middle layer as dermis and the layer which contain fat deposition as hypodermis.

The layer above dermis which is deepest layer of epidermis creates cells called melanocytes. Melanocytes are responsible for colour pigmentation of the skin. Melanocytes which are healthy as they start to grow or change colour, tumours are developed which are termed as melanoma. The melanoma can grow and can spread to other parts oforgans through surface or can grow deeper to attach and grow at internal parts of body. Melanoma sometimes is evolved from a simple mole which changes in colour, size and shape.

Earlier detected melanoma can be cured with help of medicines and surgeries. As melanoma can also grow deep in skin and attach to any internal organ it is considered as one of serious skin cancer.

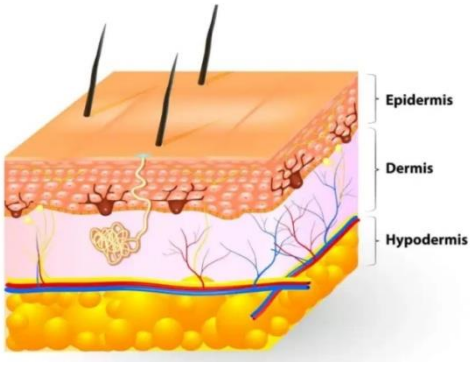

Fig. 1 Structure of Skin

After prolonged exposure of melanoma to internal organs such as blood vessel or lymph nodes it is termed as invasive melanoma and becomes difficult to operate. Earlier detection with help of new advances in technology such as machine learning makes it easier to detect and operate melanoma.

Changes in the size, shape, colour, or feel of a mole are often the first warning signs of melanoma. The changes in melanoma can appear in existing mole or totally new spot on skin may be formed. The ABCDE rules laid under derma branch helps to detect these melanomas early. The same rules if inhibited with machine learning approach considering the

rules as features can be used to detect melanoma on computer vision images of malignant skin [3].

- ***Asymmetry.*** Half shape of mole does not match the other half.
- ***Border.*** Border of mole may be blurred,notched.
- ***Colour.*** Colour may vary or shades of different colour can be seen in same mole
- ***Diameter.*** Cancerous tumour formed are big in size and are always growing thus size plays important role in detection.
- ***Evolving.*** Growing in colour shape size can be determined as evolving

1.1. Skin Detection

As per shown in fig.2 , images of melanoma and normal skin are given as input the proposed system. This system is useful for getting practical approach to classify images based on algorithms chosen for the same. Dependent on data set provided by dermatologist first we have to upload images of both the type after that segmentation, labelling regionally, refinement of the boundary, boundary edition next to that segmentation comparison and storing of segmented images as per required formats. Dependent of the results melanoma detection images are classified using SVM and image extraction is done by ANN. [2]

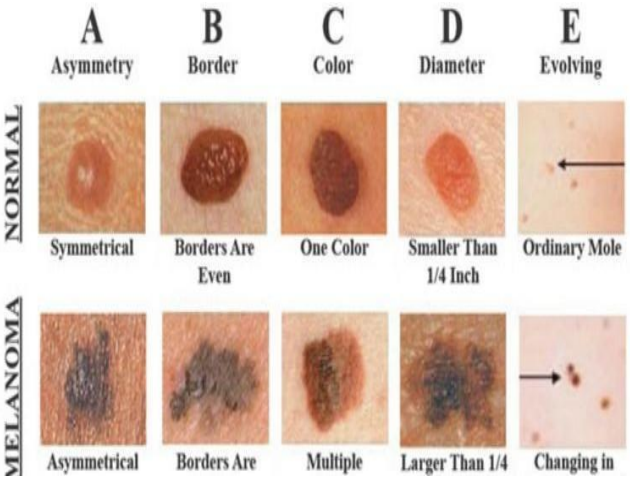

Fig. 2. Skin Detection

2. Illustrations

This approach is useful to achieve a adaptive approach in the malignant melanoma are acquiring the image, image pre-processing, highlighting of the skin features which are deterministic. The extraction of characteristics are done in an adapted image processing way by incorporating ready strategy which will result in fastest results, recognising the different features such as border, gray scale, symmetry, different shades and discovering the dimension of the images given by dermatologist. [3] Deep Neural Network was used for the dermatologist level in classifying skin cancer. The achievement of CNN is 72.1+/- 0.9% (mean+/- s.d.) total accuracy. The CNN accuracy was similar to the dermatologist details. This demonstrates the effective performance of partition algorithm. [4]

Malignant Melanoma is one among the rare and therefore the deadliest sort of carcinoma if left untreated. Death rate thanks to this cancer is 3 times quite all other skin-related malignancies combined. There is a requirement for an automatic system to assess a patient's risk of melanoma using digital dermoscopy, that is, a skin imaging technique widely used for pigmented skin lesion inspection. In this research, we aim to propose an intelligent automated method for identification of the sort of skin lesions using machine learning techniques.

3. Proposed system

As per shown in figure, input to the proposed system is image data set, which is comprises of various dermoscopic images collected from different population in varying conditions. Normally this is .csv file contains image datasets.
To demonstrate we have to import pandas library and path to read that .csv file so as to import data for processing.

Comparative study using three machine algorithms has been done which uses image processing for detecting the melanoma. The supervised algorithms used for study are SVM, Naïve Classifier and ANN and CNN. The study involves using grey level co-occurrence matrix and texture wavelength as feature extraction through which Accuracy and Sensitivity is calculated for three algorithms. The study shows ANN as good classifier among three with accuracy of 89%. Thus, machine Learning techniques with image processing are used in melanoma detection. At the same time CNN will give more accurate prediction of melanoma skin cancer image data sets which will result in fast identification and classification of infected and non infected images.[1]

4. Implementation

4.1 . Step 1 The feature extraction by MAPS

Fig. 3 Input dataset

Example Consider following input image, which when converted into greyscales and proceed for feature extraction by CNN, after that dependent on features and ABCDE rule for processing, Melanoma detection in early stages as follows.

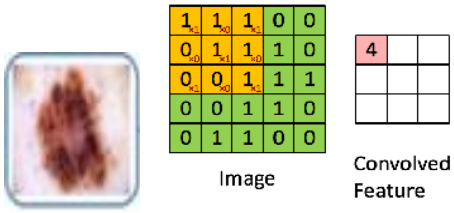

Fig 4. Feature Map

Two sorts of texture feature are wont to perform classification of melanoma and nonmelanoma. First local information through Local Binary Pattern (LBP) on different scales and grey Level CoOccurrence Matrix (GLCM) at different angles has been extracted as a texture features. These features are robust thanks to scale invariant property of LBP and rotation invariant property of GLCM features.

Global information of various colors channels has been incorporated through four different moments extracted in six different color spaces like RGB, HSV, YCbCr, NTSc, CIE L*u*v and CIE L*a*b. Therefore here hybrid texture local and color as global features has been proposed to classify the melanoma and non melanoma. Support vector machine has been used as a classifier to classify melanoma and non melanoma. Experiments are tested on wellknown dataset dermis that's freely available on the web.

CNN image classifications take an input image, process it and classify it under certain categories (Eg. Normal skin , malignant skin). Computers see an input image as array of pixels and it depends on the image resolution. Based on the image resolution, it will see h x w x d(h = Height, w = Width, d = Dimension). Eg., An image of 6 x 6 x 3 array of matrix of RGB (3 refers to RGB values) and an image of 4 x 4 x 1 array of matrix of grayscale image.

4.2. Step 2 Pooling

Sometimes filter does not fit perfectly fit the input image. We have two options:

1. Pad the picture with zeros (zero-padding) so that it fits
2. Drop the part of the image where the filter did not fit. This is called valid padding which keeps only valid part of the image.

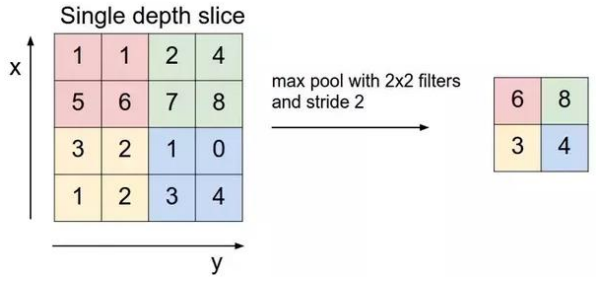

Fig. 5. Example of Max Pooling

Pooling layers section would reduce the number of parameters when the images are too large. Spatial pooling also called sub sampling or down sampling which reduces the dimensionality of each map but retains important information.

4.3.Step 3 Evaluation Based on Output Layer

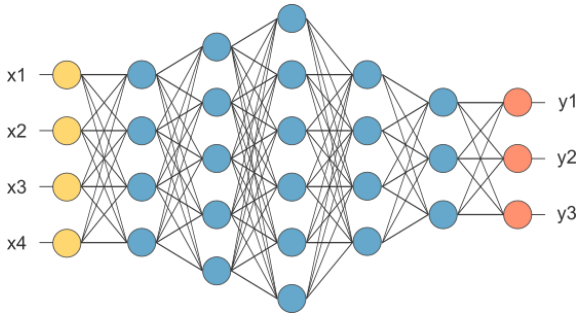

Fig. 6. Output Layer

The pixels from the image are fed to the convolutional layer that performs the convolution operation.It results in a convolved map ,the convolved map is applied to a ReLU function to generate a rectified feature map.

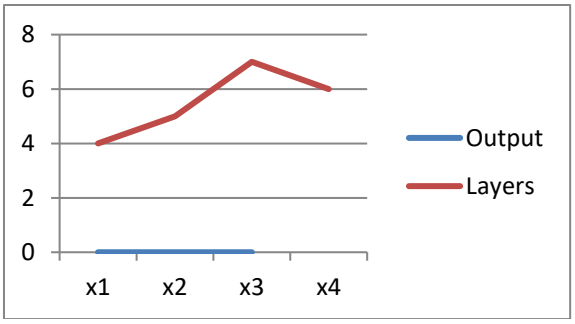

Fig. 7 Input Output

The image is processed with multiple convolutions and ReLU layers for locating the features, Different pooling layers with various filters are used to identify specific parts of the image,The pooled feature map is flattened and fed to a fully connected layer to get the final output. Fig. 7 shows the relationship between input and layers in CNN with respect to outputs.

5. Results

As shown in above proposed methodology, CNN will provide input image into convolution layer, then choose parameters, apply filters with strides, padding if requires. After that perform convolution on the image and apply pooling to reduce dimensionality size. Next to that add as many convolution layers until satisfied, Flatten the output andfeed into a fully connected layer (FC Layer). Output the class using an activation function (Logistic Regression with cost functions) and classifies images.

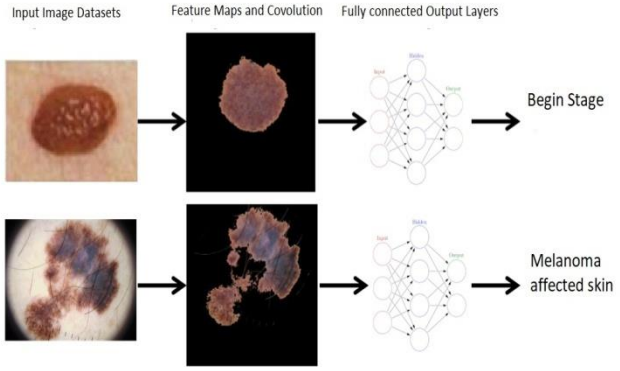

Fig. 8 output: Begin Stage and Malenoma Affected Skin

We can able detect skin cancer in early stage so as which will result in less amount of deaths happening due to skin cancer.

5. Conclusion

As shown in chart Fig. 9, by considering various datasets of sample images of skin moles from different aspects, CNN gives more precision accuracy than SVM when it is related to image processing.

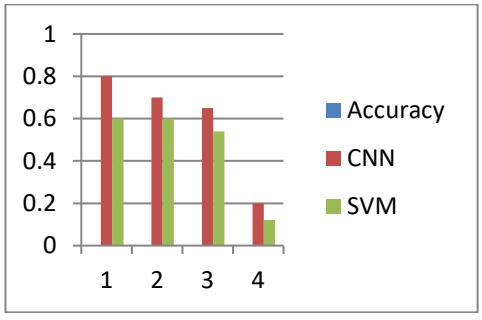

Fig. 8 Precision Accuracy Chart

In this paper, we have learned the feature extraction using ABCDE rule, how CNN can be used get more precision accuracy in image processing. Finally, we have an activation function such as softmax or sigmoid to classify the outputs as begin stage or normal or melanoma skin cancer detection. So bye using CNN we can easily find melanoma skin cancer in early stages with more precision for accuracy.

7.References

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