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Accuracy Detection & Classification of Skin Disease Detection using Image Processing and Neural Network

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Abstract: ***Dermatology is one among st the foremost unpredictable and troublesome terrains to diagnose thanks to its complexness. In most developing countries, it's costly for an over sized variety of individuals. in keeping with World Health Organization (WHO), skin diseases ar the foremost common non-communicable diseases in Asian nation. the ever-present use of smartphones in developing countries like Asian nation has spread out new avenues for cheap identification of diseases. The camera in smartphones will wont to exploit the image process capabilities of the device for identification. The planned system deals with the creation of AN application that helps in identification of disease of the skin. It uses image process and machine learning technology to sight diseases. The system consists of two parts- image process and therefore the machine learning. The image process half deals with applying numerous filters to the pictures to get rid of noise and create them uniform. it's necessary to get rid of the unwanted parts from the image before process else it'll have an effect on the output potency. The Machine learning half deals with the process of knowledge and generation of result.***
Keywords: Skin disease, Machine learning, Image processing, CNN, Multi-SVM.

I. INTRODUCTION

The term digital image refers to process of a two-dimensional image by a electronic computer. during a broader context, it implies digital process of any two-dimensional knowledge. A digital image is AN array of real or advanced variety's delineate by a finite number of bits. a picture given within the kind of a transparency, slide, photograph or AN X-ray is 1st digitized and keep as a matrix of binary digits in storage device. This digitized image will then be processed and/or displayed on a high-resolution tv monitor. For show, the image is keep during a rapid-access buffer memory, that refreshes the monitor at a rate of twenty five frames per second to provide a visually continuous show.

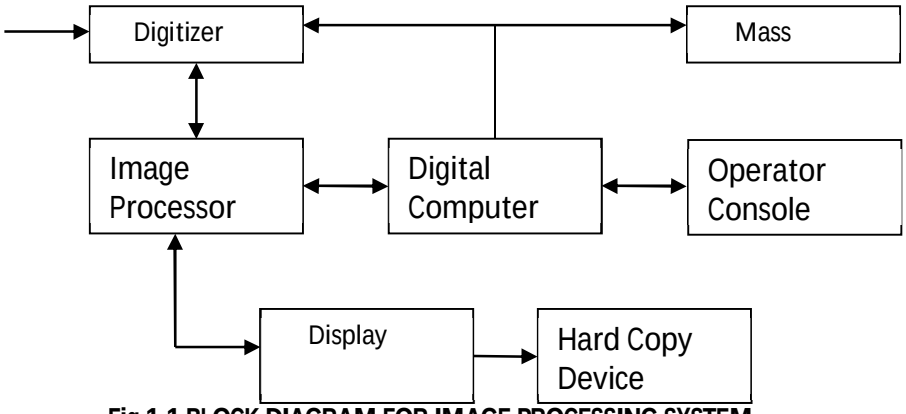


Fig 1.1 BLOCK DIAGRAM FOR IMAGE PROCESSING SYSTEM

A. Description of The Dataset

We compiled our dataset by grouping pictures from totally different websites specific to skin diseases.
The info has 320 pictures of each unwellness (80 keratosis pictures, eighty Basal CellCarcinoma pictures, eighty Dermatofibroma pictures And eighty birthmark Images).

II. RELATED SURVEY

Looking into the present things of computerized skin condition diagnosing systems, there area unit few solutions obtainable that area unit still underneath analysis developments. bound limitations and disadvantages area unit known in those therefore this answer tries to beat the prevailing issues with completely different approach [4].

In the paper " skin condition diagnosing System mistreatment Image process and information Mining' by R. S. Gound, Priyanka S. Gadre, Jyoti B. Galikwad, Priyanka K. Wagh[2], a system has been projected a picture obtained from the user is processed and divided to form a model that may predict the sickness for a replacement image of a skin condition. Feature extraction is finished on every image to extract options that may be accustomed produce classification model. With this classification model, system finally will predict the sickness for a replacement image of a skin condition which is able to be obtained by the user through robot application. And supported this expected sickness, system can raise question from the user and supported answer, system can decide sickness sort. Finally, the system suggests medical treatment or the recommendation supported expected skin condition result. The diseases taken into thought area unit skin disease, mycosis and efflorescence.

Another paper "A Image analysis System to sight Skin Diseases" by Pravin S. Ambad and A. S. Shirsat[3] presents the image analysis system to sight completely different skin diseases, wherever user are ready to take pictures of various moles or skin patches and also the system can analyze and method the image and classifies the image to a spread of skin condition. this method captures image from commonplace info and place in to the system to tell the user for preventing the threats joined to skin diseases. The system can analyze and method the image and classifies the image to traditional, melanoma, skin disease or dermo case-based extraction the image options. associate alert are provided to the user to hunt medical facilitate if the mole belongs to the atypical or skin cancer class. this system conjointly suffers from the problems with segmentation. detective work differing kinds of skin diseases from color image could be a terribly difficult task in pc vision. looking for completely different options from the colour skin pictures of the infected space of various skin diseases and detective work them with a high accuracy rate is that the primary purpose of this analysis.

In the paper "Survey of Texture based mostly Feature Extraction for skin condition Detection" by Seema Kolkur, D.R. Kalbande. it's associate approach of texture-based feature extraction for detection of skin diseases has been bestowed to resolve problems. Here applied mathematics texture analysis, texture options area unit computed from the arrangement of discovered combos of intensities at such that positions relative to 1 another. range of intensity points (pixels) in every combination, statistics area unit classified into first-order, second-order and higher-order statistics. GLCM technique could be a approach of extracting second order applied mathematics texture options. Third and better order textures take into account the relationships among 3 or a lot of pixels. These area unit in theory doable however not normally enforced thanks to calculation time and interpretation problem [1].

III. METHODOLOGY

Methodology is that the method of shaping the design, modules, interfaces, and information for a system to satisfy specific necessities. Systems style may well be seen because the application of systems theory to development. The designed system would facilitate the patients in addition as doctors to diagnose the illness to notice the diseases of the skin by simply providing the image of the affected space of skin. totally different from the prevailing detection systems counting on support vector machines or mathematical logic mechanisms, our detection system uses options extracted from input image of skin through image process algorithms at the side of feed forward back propagation neural network for classification and detection purpose. Basic options of image square measure extracted from the region of interest of skin image. These options square measure then applied to Back-propagation Neural Network rule for coaching in info or detective work illness from info. The skin condition detection system consists of 2 elements wherever the primary half is process the image of infected region victimization image process algorithms. following half is detective work the illness victimization back propagation artificial neural network.

One of the foremost normally used techniques to extract matter information of pictures is Gray-Level Co-Occurrence Matrix (GLCM). The GLCM technique provides wise surface information of an image which will be nonheritable simply from 2 pixels. Dark level co-event frameworks is familiar with by Haralick endeavour with portray surface by measurably inspecting however sure dim levels happen in association to different dim levels. Assume an image to be poor down is rectangular and has N lines and levels.

Generally digital dermoscopic pictures square measure in RGB format. therefore automatic border detection in dermoscopic pictures is troublesome to perform thanks to several reasons like low distinction of the skin surface and lesion space, fuzzy and irregular lesion borders, totally different artifacts like air bubbles and skin texture, multi coloring within the lesion.

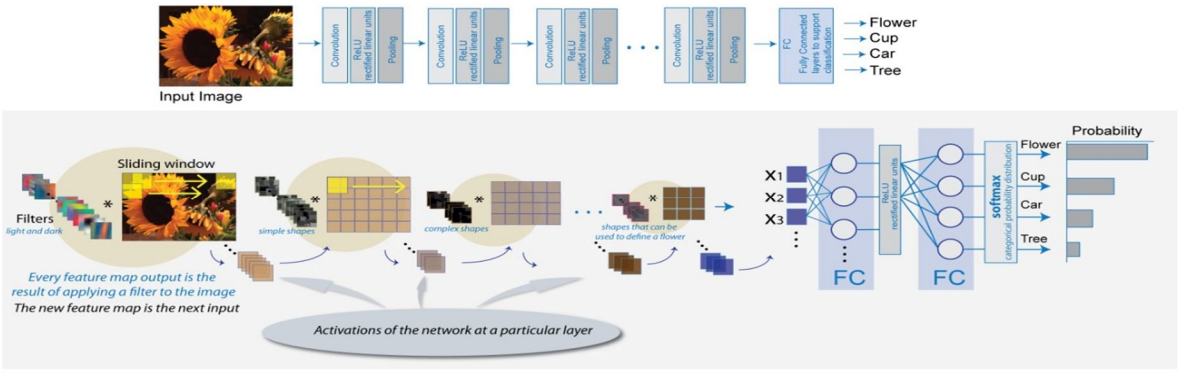
(SIFT) Scale-invariant feature transformation is associate degree rule employed in pc vision to notice and to explain native options in pictures. Scale invariant feature transformation is a picture description used for image-based matching and recognition. SIFT descriptor has been evidenced to be a lot of helpful in observe for image matching and seeing beneath real-world conditions.

support vector machines (SVMs) square measure supervised learning models with associated learning algorithms that analyze information used for classification and multivariate analysis.

Convolutional neural networks (ConvNets) square measure wide used tools for deep learning. they're specifically appropriate for pictures as inputs, though they're additionally used for different applications like text, signals, and different continuous responses. Convolutional neural networks square measure galvanized from the biological structure of a visible cortex, that contains arrangements of straightforward and sophisticated cells. These cells square measure found to activate supported the subregions of a visible field. These subregions square measure referred to as receptive fields. galvanized from the findings of this study, the neurons in a very convolutional layer hook up with the subregions of the layers before that layer rather than being fully-connected as in different forms of neural networks. The neurons square measure unresponsive to the areas outside of those subregions within the image.

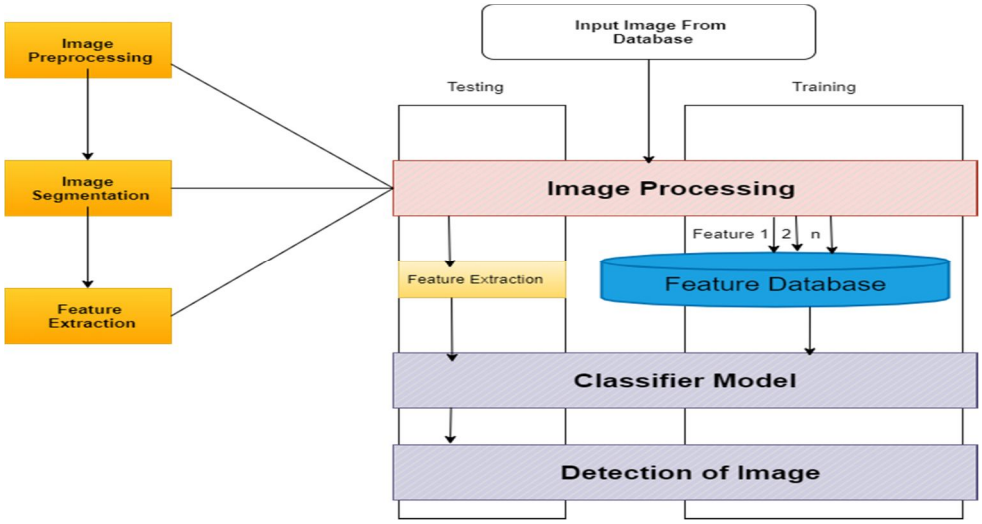
These subregions would possibly overlap, therefore the neurons of a ConvNet manufacture spatially-correlated outcomes, whereas in different forms of neural networks, the neurons don't share any connections and manufacture freelance outcomes.

In addition, in a very neural network with fully-connected neurons, the quantity of parameters (weights) will increase quickly because the size of the input will increase. A convolutional neural network reduces variety|the amount|the quantity} of parameters with the reduced number of connections, shared weights, and down sampling.



IV. IMPLEMENTATION

We add on Image process and Deep Learning techniques for learning with the options extracted, to deliver additional correct output. The projected system deals with the creation of associate application that helps in identification of disease. It uses image process, data processing and machine learning approach to notice diseases.



A. *Learning Algorithm*

We have a tendency to use feed-forward back-propagation neural network coaching to perform this step. Validation and testing for the system are done exploitation the multiple cross validation method. The virtue of employing a cross validation technique is that there aren't any overlapping of the check information and coaching information, creating the system testing results viable and dependable. we have a tendency to train our feed forward back-propagation neural network with eight totally different options, three of them ar extracted from the image preprocessing algorithms and five of them ar from user inputs. during this system we've got used a hundred neurons in our hidden layer to induce the most effective result from the system.

B. *Classification*

Classification may be Computer vision technique. when extracting options, the role of classification is to classify the image via Support Vector Machine (SVM) Or Convolutional Neural Networks (CNN).

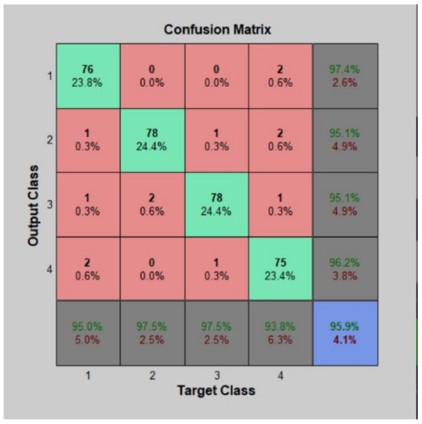
V. EXPERIMENTS & RESULTS.

In this Project, our primary focus is to develop an intelligent expert system that can classify skin Diseases using CNN and SVM. The proposed intelligent expert system is implemented using MATLAB 2014a. The dataset is divided into two parts, i.e. training data and testing data in the ratio of 70:30.

$$Accuracy = \frac{TP + TN}{TP + FP + TN + FN} \text{x}100 \ldots\ldots\ldots$$

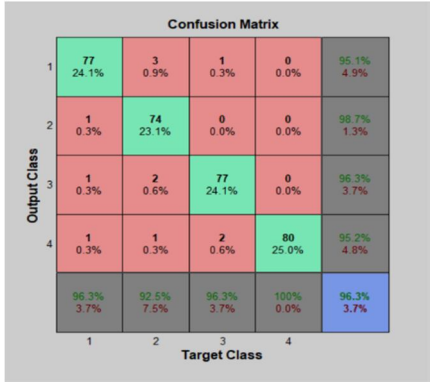
The terms true positive, true negative, false positive and false negative are Explored Below With Accuracy table.
When the classification is performed using SVM AND CNN.

A. *Support Vector Machine (SVM).*



95.9 % accuracy is achieved for SVM.

B. *Convolutional Neural Networks (CNN)*



96.3 % accuracy is achieved for CNN.

VI. CONCLUSION

This Project work predicts the skin disease for 4 types of skin disease i.e actinic_keratosis, basal_cell_carcinoma, dermatofibroma and nevus using Image Processing algorithms. The classification was done using SVM classifier and CNN classifier. Comparison between CNN and SVM Classifier is done with the help of the confusion matrix and the detailed table showing the accuracy of both the classifiers. According to the result obtained, CNN classifier proved to be accurate and efficient in detecting skin disease as compared to SVM Classifier. Further an email notification was added which send across the remedies for the respective disease. The Application was developed in MATLAB UI based interface, which can be further worked upon to work for real time with better accuracy.

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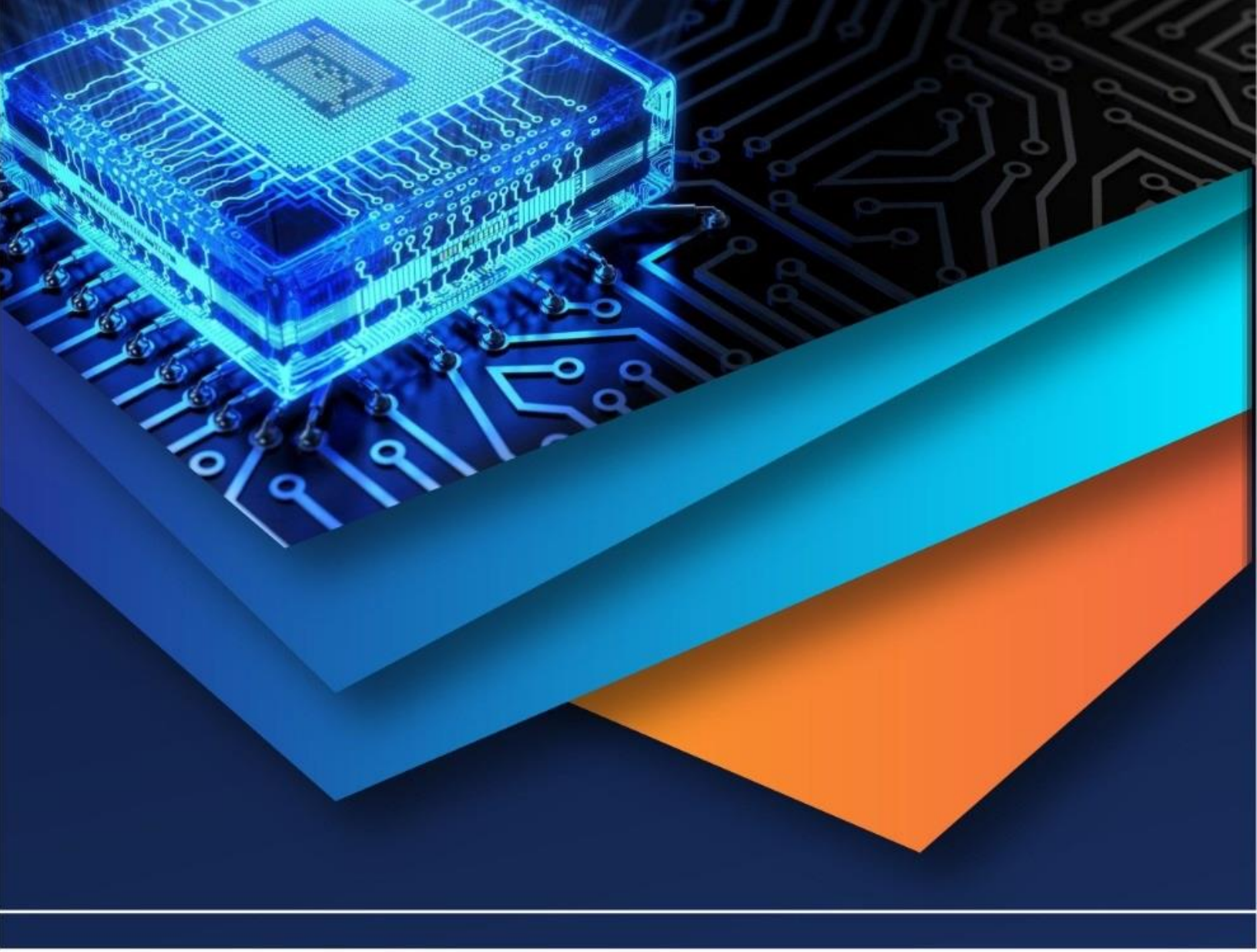

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