DIGITAL DERMATOLOGY : SKIN DISEASE DETECTION USING IMAGE PROCESSING

Navabharathi S[1], Padmadevi S[2], Vishnupriya R[3], Ganesh K R[4]

Student, Department of EIE, SRM Valliammai Engineering College, SRM Nagar, Kattankulathur, Tamilnadu, India
Assistant Professor, Department of EIE, SRM Valliammai Engineering College SRM Nagar, Kattangulathur, Tamilnadu, India

ABSTRACT

Dermatology is one of the most unpredictable and difficult terrains to diagnose due its complexity. In the field of dermatology, many a times extensive tests are to be carried out so as to decide upon the skin condition the patient may be facing. The time may vary from practitioner to practitioner. This is also based on the experience of that person too. So, there is a need of a system which can diagnose the skin diseases without any of these constraints. We propose an automated image based system for recognition of skin diseases using convolutional neural network classification. This system will utilize computational technique to analyze, processand relegate the image data predicated on various features of the images.

Skin images are filtered to remove unwanted noise and also process it for enhancement of the image. Feature extraction using complex techniques such as Convolutional Neural Network (CNN) with AlexNet and classifying the image based on the algorithm of softmax classifier as well as obtaining the diagnosis report as an output. This system will give moreaccuracy and will generate results faster than the traditional method, making this application an efficient and dependable system for dermatological disease detection.

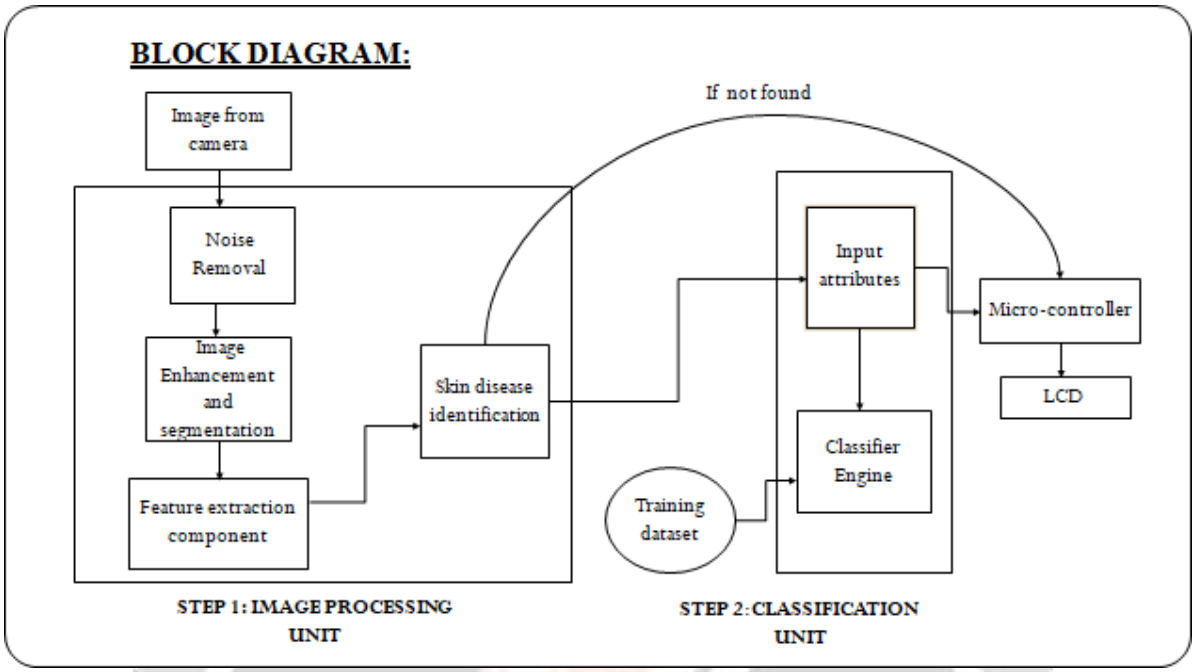
KEYWORDS: *Deep Learning, Convolutional Neural Network, AlexNet, Softmax*.

I.INRODUCTION

Skin diseases are one of the most common diseases in humans and its incidence is increasing dramatically. Based on a survey in 2010, skin diseases had the fourth leading cause of nonfatal disease burden in the world, and three of the world's most common diseases were skin diseases. Many of them are dangerous, particularly if not treated at an early stage. Skin diseases are becoming common because of increasing pollution. It has caused enormous economic burdens both in high-income and low-income countries. For each individual, skin problems can have adverse effects on all aspects of life, including interpersonal relationships, work, social functioning, physical activity and mental health.

Skin disease classification system is developed and the relationship of the skin disease image across different type of neural network is established. The collected medical images or images from WebCam are feed into the system, and using different image processing schemes image propeties are enhanced. Useful information can be extracted from these medical images and pass to the classification system for training and testing using MATLAB image processing toolbox for detection of skin disease.

II. BLOCK DIAGRAM



BLOCK DIAGRAM DESCRIPTION

1. Image Acquisition:

Images are collected from public database.

2. Preprocessing:

- The second stage of skin disease classification is *noiseremoval* and *contrast normalization*. After that image *resizing* process (227*227) is implemented.
- In that, median filter is used to remove the noise in skin image.

3. Skin disease classification:

- After the preprocessing, skin feature extraction and skin disease classification is implemented using AlexNet CNN.
- The network has rich feature representations for wide range of images. The AlexNet has 25 layers. The network has an image input size of 227-by-227. For our work, we change fully connected layer and classification layer.
- After defining the network structure, specify the training options. Train the network using *stochasticgradientdescent* with *momentum* (SGDM) with an initial learning rate of 0.01. Set the maximum number of epochs from 5 to 500. An epoch is a full training dataset**.** Train the network using architecture defined by layers, training data, training options.
- Finally, classify the disease of the validation datausing the trained network.

III. LITERATURE REVIEW

"An Integrated Deep Learning Approach for Nail Disease Identification"

AUTHORS: Ayushi, Rose Verma, Rahul Nijhawan, Shashank Bhushan, Rajat Dua, Ankush

Mittal.

- For the analysis of a single nail disease three CNN networks(F1,F2,F3) in order to achieve classification accuracy and efficiency.
- The three vectors obtained from CNN where combined together forming final feature vector (F). Random Forest classifier is implemented for classification on final feature vector.
- Accuracy assessment is performed in which accuracy and kappa co-efficients are computed along with ROC curves.

"Multi-Class Skin Diseases Classification Using Deep Convolutional Neural Network and Support Vector Machine"

AUTHOURS: Nazia Hameed, Antesar M. Shabut, M. A. Hossain , Anglia Ruskin Research IT Institute Anglia Ruskin University ,Chelmsford

- In this paper, for classification Error Correcting Output Codes(ECOC) linear SVM is applied to extract features
- While comparing the proposed research work with existing work in literature, in most cases proposed intelligent expert system classify more disease than the existing work in literature but the accuracy(appx. 76%) is less than our work.

"Advances in Deep Learning Techniques for Medical Image Analysis"

AUTHORS:Usma Niyaz, Abhishek Singh Sambyal, Devanand, Dept. of Computer Sc. & IT Central University of Jammu, INDIA(2018)

- In this paper they implemented CapsNet technology which is 3 layer architecture.
- Regularization methods help to overcome the problem of overfitting and tuning of hyperparameters which improves the performance of the deep neural networks without making any kind of changes in the architecture which is very effective and feasible.

IV. SYSTEM

DESIGN Data
Flow Diagram:

1. TheDFD is also called as bubble chart. It is as imple graphical formalism

   that can be used to represent a system in terms of input data to the system, various processing carried out on this data, and the output data is generated by this system.
2. The data flow diagram (DFD) is one of the most important modeling tools. It is used to model the system components. These components are the system process, the data used by the process, an external entity that interacts with the system and the information flows in thesystem.
3. DFD shows how the information moves through the system and how it is modified by a series of transformations. It is a graphical technique that depicts information flow and the transformations that are applied as data moves from input to output.
4. DFD is also known as bubble chart. A DFD may be used to represent a system at any level of abstraction. DFD may be partitioned into levels that represent increasing information flow and functional detail.

PERFORMANCE ANALYSIS

VI. CONCLUSION

The convolutional neural network based system was implemented to classify the disease present in the input skin image (either from a dataset or WebCam). Skin image with different shape & size of the disease images has been fed at the input for training the system. The proposed system is able to classify the different types of skin disease with accuracy of about 99%.

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