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HAZARDOUS CHEMICALS BASED SKIN DISEASES CLASSIFICATION USING DEEP LEARNING:A REVIEW

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Abstract: Skin infection diseases due to hazardous chemicals are more usual as compared to other common skin diseases in our society. The human beings encounter with diseases due to hazardous chemicals because of distinct environmental aspect present in the world and absence of individual care or other factors such as chemicals present in daily use products. The experience and proficiency of the doctor/pathologist determine accurate diagnosis of skin diseases, as inaccurate diagnosis leads to financial damage and adverse health effects on the patient. In our proposed research work, we will deal with the identification of skin diseases due to hazardous chemicals present in daily use product/chemicals such as pesticides, cosmetics, detergent, paint, sanitizer, petrol, diesel etc with machine learning algorithms. Convolution neural network is main approach of skin disease identification with efficient deep learning network model having best accuracy rate. Our hazardous chemicals skin disease identification model will utilized large number of images for training the network using ISIC dataset. The AlexNet, ResNet, VGGNet, Inception, DenseNet, MobileNet, Googlenet or any other efficient network will be used to conclude our proposed research work.

Index Terms **- Hazardous Chemicals, Skin diseases, ISIC dataset, Convolutional Neural Networks (CNN), Deep learning.**

I. INTRODUCTION

Now a days, electronics system are used to identify the diseases through ECG, MRI SCAN, X-ray etc. Before the evaluation of medical instrument-system. the diagnosis of skin diseases were dependent on the experience and proficiency of the doctors. Diagnosis error or inaccurate diagnosis leads to negative health impact on patient and financial loss of the patient. In skin diagnosis, image processing plays very important role in detection of skin disease. Hazardous Chemical exposures on skin may have serious consequence on health which may be temporary or permanent. A hazardous chemical is something that has the capability to cause detriment such as injury, illness or harm to skin. These adverse health effects may appear on skin with the contact of hazardous chemical. It may be possible that hazardous chemical enter into human body through skin by wound or by penetrating through the skin. Then the hazardous chemical can be scattered by the blood stream causing health issues in the body. Hazardous Chemical exposures to the skin are in daily occurrence in a Agriculture Industry, Manufacturing. Services and hazardous chemicals based daily use product such as detergent, paint, cosmetics, petrol, Diesel, pesticide etc.

The COVID-19 pandemic has grown worldwide and it has serious impacts on people health issue. World health origination (WHO) directed to use hand sanitizer regularly to disinfect hands from corona virus. Alcohol Based Hand Sanitizer consist of alcohol with hazardous chemicals like excipients or humectants. An irritant contact dermatitis can vary from slight to significant adverse reaction such as dryness and bleeding on skin. Alcohol based hand sanitizer cause drying effect on hands which include allergic contact dermatitis to the skin like crack and viral disease [1][2]. Medical experts shared advise that the extensive use of alcohol based hand sanitizers as a protective measure against the corona virus will indirectly hike the possibility of germs responsible for skin disorder.[3].

II. LITERATURE SURVEY

The skin disease treatment in conventional way by the general practitioner or specialist depends upon his ability and practice in skin diagnosis domain. The dermatoscopic pictures used to differentiate current condition of the patient's skin lesions depends upon the features and guidelines given by expert for the diagnosis process. The visible inspection of the skin lesions to find required details of the patient followed by dermoscopic and histopathology examination to determine the status of skin lesions sum up as a diagnosis process. The emergence , complexion, poisoning, scattering , color, borderline, formation of dusky skin lesions are analyzed by doctor in accordance with dermatoscopic observations techniques like three-point index checklist[4], and a new practical method for early skin diseases recognition such as guidelines rule of dermatoscopy [5] and seven-point index checklist [6].

The skin diseases features of each patient are convoluted due to the skin disease images are more complex. A small difference between the characteristics of skin disease changes the category of skin disorder and this lead to misdiagnosis and affect accurate treatment of the patient. This issue of skin diseases identification can be overcome using the help of artificial intelligent in medical field by skin images processing and machine learning. But The skin disease identification using machine learning technique needs huge amount of time and energy due to feature extraction process done manually. The flowchart of skin diseases identification system with machine learning is shown in figure 1. To overcome the problem faced in machine learning, the deep learning technique was used because feature extraction done automatically.

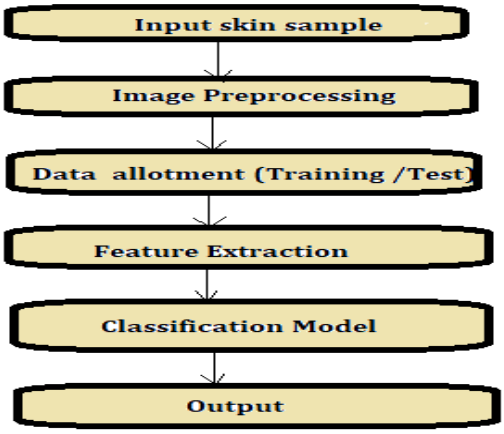

Figure 1. Flow Chart of skin Disease Identification

The Deep Learning (DL) approach was presented first time in the field of machine learning research area in 2006 year. It was acknowledged as a hierarchical learning in machine learning research area and it was consistently involved in various research activities such as pattern recognition. The basis of deep learning is hierarchical estimated features and illustration of data which includes identifying the features from low to high level. The standard approach of machine learning does not work properly while executing directly with omitting the type of image configuration. The attributes of input images as a feature extraction has significant role for getting remarkable output in image processing. Digital image processing is absolutely significant factor in the research area when deal with a deep learning model . The correlation among deep learning and shallow learning in artificial neural networks lead to enhance achievement in medical field for disease prognosis. Magnetic Resonance Imaging (MRI) [7] is used to obtain an image of brain which was developed to identify a probable Alzheimer disease [8]. Optical Coherence Tomography (OCT) system in which deep learning algorithm are producing remarkable outputs. Traditionally, images are examined by physically for advancement of convolutional matrices [9] Alam et al. [10] developed automatic system for identification of eczema by image processing using support vector machine that includes many steps such as segmentation of the captured image and feature extraction through texture-based data for excellent prognosis. The Support Vector Machine (SVM) for analysing the development of eczema is given by I. Immagulate [11]. Artificial Neural Networks (ANN) [12] and Convolutional Neural Networks (CNN) [13] are very much essentially used approaches for determining and prognosis from radiological imaging system. The CNN approach with remarkable outputs are encouraging for Skin disorder diagnosis [14].

The skin disease categorization is prime implementation of deep leaning technique to identify skin disease. Feature extraction of skin lesion tissues through skin disease images plays main role for skin disease identification in deep learning. Based on feature extraction, the type of skin diseases are determined and concluded. In this research study DermNZ, DermIS, Dermnet, and DemQuest datasets was used that includes variety of skin diseases. Nondermoscopic Images of Melanoma skin disease dataset are widely used along with psoriasis and Eczema. We summaries the details about number of diseases identified, types of skin disease and number of input images was used in research articles in Table No.1

TABLE No. 1. Number/Types of Skin Disease Identification

Reference No.	No. of Skin Diseases	Number of Input Images	Type of Skin Diseases
15	10	1300	Nevus
16,17,18,25,	2	1279	Nevus, Melanoma
19,25, 26	3	2000	Eczema, Psoriasis ,Nevus, Seborrheic Keratosis
20,24, 27	2	170	Nevus, Seborrheic Keratosis
22	2	724	Melanoma
23,24,27, 28	7	23906	Nevus, Melanoma
26	2	200	Eczema, Psoriasis
30	6	6000	Eczema , Psoriasis ,Seborrhoea

The classification of skin diseases is more prominent by using ISIC competition dataset of the skin disease dataset. ISIC competition dataset was frequently adapted skin disorder dataset which having variety of data and feature. The ISIC 2018 dataset was presented by the International Skin Imaging Collaboration (ISIC) with big dataset of dermoscopy skin images which was used in the research articles as a skin disease dataset [23],[24], [28] while other articles uses ISIC 2016 as a skin disease dataset 16], [18], [25], [28]. The primitive dataset ISIC 2017 is made with 2000 images, 374 images of Melanoma and 254 skin images of Seborrheic Keratosis was used for training and classification [19], [25]. The International Skin Imaging Collaboration (ISIC) datasets knows as a popular archive for analytics of skin diseases in machine learning and combination of ISIC datasets are more effective for analysis of skin disease as ISIC datasets contain variety of skin images [17], [24], [26], [27], [28], [30].

A researcher/analyst adapt to use various dataset to conclude research as individual dataset has bounded number of images. The excellent feature of Deep Learning as feature extraction characteristics over an artificial intelligent system like conventional machine learning which learn automatically from raw data such as input skin image pixel. A use of Convolution neural network in deep learning is main technique of skin disease identification. The Convolution neural network has outstanding excellence for feature illustration in classification of skin disease image.

TABLE No. 2. Network Model and performance

References	Model	Accuracy Explanation	Accuracy
15	AlexNet	Identification and prediction of Skin disease	85.80%
16	ResNet	Identification and prediction of Skin disease	87.00%
17	VGGNet	Performance of classification Network among all classification edge value	79.50%
18	ResNet	Identification and prediction of Skin disease	86.28%
19	VGGNet	Skin diseases samples of skin with accurate percentage was predicted.	71.34%
20	Inception	Skin diseases samples of skin with accurate percentage was predicted	------
21	ResNet	Skin diseases samples of skin with accurate percentage was predicted	------
22	VGGNet	Identification and prediction of Skin disease	83.51%
23	DenseNet	Identification and prediction of Skin disease	85.00%
24	ResNet	Skin diseases samples of skin with accurate percentage was predicted	------
25	VGGNet	Performance of classification Network among all classification edge value	------
26	AlexNet	Identification and prediction of Skin disease	97.47%
27	AlexNet	Skin diseases samples of skin with accurate percentage was predicted	97.70%
28	Inception and ResNet Combination	Skin diseases samples of skin with accurate percentage was predicted.	89.28%
29	AlexNet	Identification and prediction of Skin disease	76.66%
30	MobileNet	Identification and prediction of Skin disease	81.00%

The detail literature of Convolution neural network model was collected in the paper shown in Table.2 AlexNet convolutional neural network (CNN) was the main architecture that utilize sequential convolutional layers was used for skin disease identification [15], [26], [27] , [29] while VGGnet is famous model for image classification was used frequently by researcher [17], [19], [22], [25]. Skin images recognition and decision making feature of an inception network model was used for skin disease identification [20], [28]. ResNets is a most capable Neural Network design which support to maintain a lesser error percentage was used for skin disease classification.[16], [18], [21], [24], [28]. A DenseNet is form of convolutional neural network that uses dense network among layers [24] and the MobileNet architecture is depends on depth wise separable convolutions [30] was used in deep leaning for skin disease classification and identification.

The literature article described in table No.2 , the accuracy rate of three paper has less than 70% to 80%. Seven articles have 80% to 89% accuracy rate and two articles have above 90% accuracy rate. The articles in literature surveyed have shown excellent observational capacity of deep learning technique

III. PROPOSED METHODOLOGY

The methodology for the extraction, classification and detection of skin diseases due hazardous chemicals is described in proposed system block diagram as shown in figure.2. The proposed system can support necessarily in the detection of skin diseases due to hazardous chemicals present in pesticide, cosmetics, detergent, paint, sanitizer, petrol, and diesel. The entire architecture consists of image preprocessing, feature extraction with CCN training, Hazardous chemical skin diseases identification model and at the end classification.

Image Preprocessing: The excellent achievement of skin disease identification model for detecting skin diseases due to hazardous chemicals present in pesticide, cosmetics, detergent, paint, sanitizer, petrol, diesel needs to generates the database with universal image having dimensions such as magnitude, height, length, depth. The database with mismatched skin image sizes can be correlated with equal sizes of Images by decreasing or increasing image size to obtain unique image size to get same feature for entire input image through resizing. The performance of system increases and processing period decreases with the help of resizing.

Feature Extraction and Training with CCN: The Convolutional Neural Network (CNN) is a fixed set of layer of linear and nonlinear processes. The convolutional layer and fully connected layer are prime sub block ofConvolutional Neural Network (CNN). Feature extraction by pre train CNN using deep learning in proposed system will be used due to simple and powerful way in deep learning model.

Classification: The aspect of classification is classify the skin diseases images due to hazardous chemicals present in pesticide, cosmetics, detergent, paint, sanitizer, petrol, and diesel accordingly after feature extraction using support vector machine. The support vectors machine is a perfect trained classifier that utilizes feature extraction database in deep learning technique to classify skin diseases due to hazardous chemical.

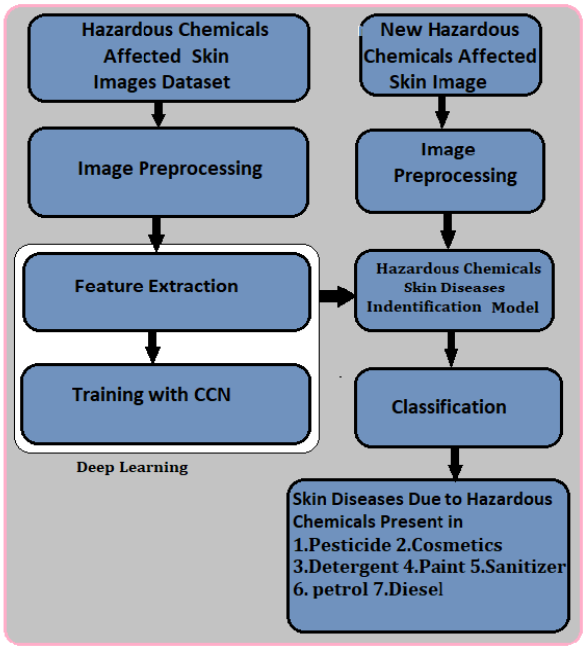

Figure.2 Hazardous Chemicals Affected Skin Disease Classification System Block Diagram

IV. CONCLUSION

The tendency of skin disorder occurrence in a lot of forms, lack of expert dermatologists, and the demand for well-timely and perfect prognosis is necessary in medical field. Detection of skin disease due to hazardous chemicals present in pesticide, cosmetics, detergent, paint, sanitizer, petrol, and diesel is extremely significant move for curtailment death percentage. Skin diseases infection to other human being and growth of skin diseases may reduce due to skin diseases identification model. Traditional skin diagnosis methods are more costly and long-lasting process. Our proposed skin disease identification system help the doctor/pathologist to identify type of skin disease at early stage as feature extraction shows important performance to identify skin disease. In artificial intelligent era, the advancement in skin disease diagnosis system using machine learning technique such as deep learning, the identification of the type of skin diseases and the procedure of conventional skin diagnosis techniques summaries in this paper.

About eighteen related article, for skin disease identification and skin disease type are identifies in the literature survey which avail the advantage of ISIC dataset as source data. The AlexNet, ResNet, VGGNet, Inception, DenseNet, MobileNet deep leaning network are universally adapted for skin disease identification. In our proposed future study, we deal with the aspect and best technique of deep learning model presented in literature survey to recognize the skin diseases due to hazardous chemicals present in pesticide, cosmetics, detergent, paint, sanitizer, petrol, and diesel. In machine learning field, the illustratable analysis to detect the Hazardous chemicals based skin disease for classification and identification is unexplored area and we explore in our research work.

The deep learning techniques. in the area of skin disease identification will be adapted for perfect classification and identification of skin diseases due to hazardous chemicals present in daily use product/chemicals such as in pesticide, cosmetics, detergent, paint, sanitizer, petrol, diesel to guide clinical automated medical diagnosis.

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