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A Review on a Machine Learning Approach to Skin Cancer Detection

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Abstract: *Skin cancer, one of the most common cancers worldwide, accounts for around one- third of all diagnosis. The main cause of skin cancer is unrepaired DNA breaks in skin cells, which result in genetic mistakes or skin mutations. The importance of early detection of skin cancer symptoms cannot be overstated given the rising incidence, high mortality rate, and expensive medical treatments. Researchers have created several early skin cancer screening methods due to how hazardous these problems are. Skin cancer is identified and benign skin cancer and melanoma are distinguished using the lesion's features, such as its symmetry, colour, size, and form. Dermatologists make a diagnosis based on the layer-by-layer arrangement of skin lesions. CNN was superior to even board-certified dermatologists. Additionally, methods that enlist mechanical aid to detect cancer are more successful. Artificial intelligence that organises information and generates decision-making processes in a manner like that of the human brain.*

Keywords: DNA, mutation, mortality, benign, melanoma.

I. INTRODUCTION

Genetic instability and a collection of different sub-atomic abnormalities are the main causes of the mind-complex illness known as human malignant growth. When the malignant growth cells have spread to many organs, the disease is frequently assessed and treated after it has reached an irreversible stage. pieces of the body These issues have led to a global trend where illness is now the leading cause of death for all age groups.

Melanocytic cells proliferate abnormally in the skin, a condition known as skin cancer. Skin cancer is commonly identified by a lesion on the skin. The most dangerous kind of skin cancer is melanoma, which can take many different forms. If these types are identified early and treated, survival rates will rise.

A computerised image processing framework typically consists of three stages: accurate segmentation, feature extraction, and lesion type determination. The correct segmentation is the most crucial phase because it impacts the accuracy of the subsequent processes. A different forecasting technique known as the AI Process, also known as the Machine Learning Technique, was proposed after it was determined that image processing alone couldn't generate an accurate result.

The first stage is to compile a dataset including photos of non-cancerous skin lesions as well as two distinct malignancies. The images are divided into the foreground and background by turning them into greyscale during the preprocessing stage using the OTSU thresholding approach. The pre- processed image data is segmented using the K- means clustering algorithm, where the images are grouped by colours. This yields the input image. The results are projected as to whether the image belongs to either of the two categories of malignant lesion or non-cancerous lesion using a variety of machine learning algorithms, including CNN (Convolutional Neural Network) and LSTM (Long Short-Term Memory) Neural Network.

II. LITERATURE SURVEY

[1] Shi Wang, Melika Hamian. "Skin Cancer Detection Based on Extreme Learning Machine and a Developed Version of Thermal Exchange Optimization," Computational Intelligence and Neuroscience/2021/Article.

The region of interest in the image is segmented after the images have first undergone noise reduction and contrast enhancement. The input image was then divided into two classes, healthy and malignant, using an Optimized Deep Belief Network (DBN) following feature extraction.

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[2] F. Santos, F. Silva, and P. Georgieva, "Automated Diagnosis of Skin Lesions," 2020 IEEE 10th International Conference on Intelligent Systems (IS), Varna, Bulgaria, 2020, pp. 545-550 Fabio Santos et al. provided a thorough overview of the prospects and problems in dermatology care while concentrating on the state of automated skin lesion diagnosis at the time.

[3] M, Vijayalakshmi. (2019). Melanoma Skin Cancer Detection using Image Processing and Machine Learning. International Journal of Trend in Scientific Research and Development. Volume-3.

In contrast to traditional medical personnel-based detection, it introduced a fully automated approach of recognising dermatological diseases through photographs of lesions. We used various AI techniques, including Convolutional Neural Network and Support Vector Machine, with image processing technologies to create a more accurate structure.

[4] Gaana, M and Gupta, Shweta and Ramaiah, Narayana Swamy, Diagnosis of Skin Cancer Melanoma using Machine Learning (March 22, 2019). In this paper Image collection, Pre- processing, Segmentation, Noise removal, and Feature extraction have all been employed by Gaana M. et al. They have employed Supervised Machine Learning with Cubic Regression for the first time. With this technique, the machine was trained to automatically identify the stages of skin cancer as Benign, Melanoma, and Melanoma

[5] Research on Skin Cancer Cell Detection using Image Processing Enakshi Jana* Dr.Ravi Subban*, S. Saraswathi

Dept. of Computer Science Pondicherry University Kalapet, Puducherry, 605014 Squamous cell carcinoma (SCC), melanoma, and basal cell carcinoma (BCC) are the three different kinds of skin cancer. Melanoma is the most severe type and has an extremely poor survival rate. Melanoma early identification may increase survival rates. This essay conducts a thorough literature review of skin cancer detection techniques currently available. The best results are obtained using SVM and Adaboost among all skin cancer detection techniques. The application of SVM for skin cancer picture classification along with a survey and study of the many types of ANN architecture, together with the accuracy outcomes and performance, are included in this paper. The functioning and detection of melanoma are briefly described, which is helpful for classifying normal and abnormal behaviour.

[6] Diagnosis of Skin Cancer Melanoma using Machine Learning Ms. Gaana M, Dr Shweta Gupta, Dr Narayana Swamy Ramaiah JAIN Deemed to be University, Bangalore, Karnataka, India

In this study, we used feature extraction, segmentation, noise removal, and image acquisition. We have employed Supervised Machine Learning with Cubic Regression for the first time. With this technique, we programmed the system to automatically identify the stages of skin cancer as benign, melanoma, and melanoma.

[7] Performance Analysis of Melanoma Early Detection using Skin Lession Classification System R.S. Shiyam Sundar, M. Vadivel ETCE Dept Sathyabama University, Chennai – 600119, India, Because skin is exposed to UV light from the sun, the number of skin cancer sufferers will rise steadily. It is challenging to stop, and the effects can build up. Therefore, early detection is crucial for diagnosis and therapy. In order to simulate a system for early detection and classification, the MCSVM classifier method was used in this research. The outcomes of the simulations demonstrated One-Against-All MCSVM's better performance and accuracy. All five types of melanoma skin cancers are subjected to the suggested algorithm, and the resulting data are segmented to identify the region and area of abnormality more accurately

[8] Machine Learning and Its Application in Skin Cancer Kinnor Das,1 Clay J. Cockerell,2,3 Anant Patil,4 PawełPietkiewicz,5,* Mario Giulini,6 StephanGrabbe,6 and Mohamad Goldust6,*

The technology-oriented approach divides artificial intelligence (AI) into three categories: artificial narrow intelligence (AI), artificial general intelligence (AI), and artificial superintelligence (AI). Narrow AI can intelligently carry out a certain task. The most common application of narrow AI. General AI has the ability to perform any intellectual task just like a human. Super AI may be able to perform any task better than humans with cognitive traits and surpass human capabilities. Only weak or limited AI, like Apple's SIRI, which trains a machine to perform a certain task, is available to us at the moment. AI systems known as reactive machines do not store experiences in order to carry out any tasks in the future. They simply take into account the current situation and respond appropriately. These include Google's AlphaGo and IBM's Deep Blue system, for instance. Self-driving cars and other AI machines with limited memory are only able to store memories or data for a limited amount of time. Human emotions, personalities, and beliefs are all included in theory of mind, along with social interaction skills. This type of AI machine has not yet been developed. AI integration in smartphone apps can instruct users on how to conduct skin examinations and relay the results to a doctor.

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In order to create a new ML skin cancer algorithm, each type of skin lesion is given a class, such as "benign" and "malignant," or "naevi" and "melanoma." Before being tested on a new image, deep learning algorithms are taught on a huge number of images in each class. The process is composed of three fundamental steps. Digitalized macroscopic or dermoscopic images with "ground truth" labels are provided to the algorithm in the first stage (in this case, the ground truth is the lesion diagnosis, which is determined by an experienced dermatologist or by histological study). Convolutional layers are used in stage 2 to extract the feature map from the photos. Several levels of abstraction are available in a feature map, which is a visual representation of the data. The earliest convolutional layers extract low-level characteristics including shapes, corners, and edges. The higher-level data is extracted by further convolutional layers to identify the type of skin lesion. The stage 3 feature maps are used by the machine learning classifier to distinguish between several types of skin lesion patterns. Deep learning can now be used to classify a brand-new image.

[9] A Color-Based Approach for Melanoma Skin Cancer Detection Shalu,1 Aman Kamboj,2 Department of Computer Science and Engineering Dr. B.R. Ambedkar National Institute of Technology Jalandhar, India

This study develops a technique for melanoma skin cancer detection. First, several preprocessing and segmentation techniques are used to improve the image and isolate the region of interest.methods were employed. The HSV and YCbCr colour spaces were used to extract a number of attributes. Three different classifier types—Naive Bayes, Decision Trees, and KNN classifiers—have their feature performance evaluated. By reaching an accuracy of 82.35% in comparison, it can be concluded that the Decision Tree classifier performs better than the other classifiers. The method more accurately recognises the benign situations since its specificity is higher than its sensitivity. The technology has a higher level of overall accuracy than earlier methods. To make the sensitivity more acute Additional characteristics that work well with the HSV and YCbCr colour space features can be used, including border, shape, and texture features. This will assist in increasing the system's accuracy.

[10] A Melanoma Skin Cancer Detection Using Machine Learning Technique: Support Vector Machine

We can be confident that the application that will be used in the future thanks to the SVM algorithm will contribute to improving human lives. Where the disease can be detected early on or in advance, it is possible to determine what kind of disease the patient has and what needs to be done before it is too late for them. If the melanoma is discovered in time, the survival rate will be higher. The ability to identify sickness is very accurate. Machine learning can be useful in the medical industry because it is crucial for detecting skin cancer. Utilizing modern technology will make things simpler. Future medical advancements will greatly benefit from it.

[11] A SVM-Based Diagnosis of Melanoma Using Only Useful Image Features Suleiman MUSTAFAt, Akio KIMURA:I:

The authors of this study suggested a technique for identifying melanoma skin cancer from a picture of the affected skin areas. The technique entails standard image processing steps like image enhancements, the GrabCut algorithm combined with the mean shift segmentation algorithm, feature extraction and calculation, and an SVM classification model. Our tests revealed that high accuracy can be attained with a small number of useful feature sets. Particularly, only six characteristics are enough to identify the majority of malignant cases and deliver reliable information for skin cancer detection. Before such methods can be utilised clinically to aid in the detection of melanoma, however, more research, testing, and experimentation on larger datasets are necessary. Soon, we also intend to apply certain ensemble learning techniques.

[12] Melanoma Skin Cancer Detection using Image Processing and Machine Learning Vijayalakshmi M M, Assistant Professor, Department of Information Science & Engineering GSSSIETW, Mysuru, Karnataka, India

The purpose of this study is to identify an accurate skin cancer prediction method and to categorise skin cancer as either malignant or non-malignant melanoma. To achieve this, a few pre-processing operations including hair removal, shadow reduction, glare removal, and segmentation were carried out. To categorise, SVM and Deep Neural networks will be employed. A classifier will be taught the features and then be used to categorise. The innovative aspect of the current methodology is that it should do the detection quickly, assisting the technicians in honing their diagnostic abilities. Any dataset can be used to determine the efficiency because the used dataset is from the publicly accessible ISIC (International Skin Image Collaboration) dataset.

[13] Skin Cancer Detection Based on Extreme Learning Machine and a Developed Version of Thermal Exchange Optimization Shi Wang1 and Melika Hamian 2 1 Department of Computer Engineering, Dongguan Polytechnic, Dongguan 523808, Guangdong, China 2 Department of Engineering, Payame Noor University (PNU), Tehran, Iran

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There are various forms of skin cancer, with skin cancer being acknowledged as the most dangerous and prevalent type of cancer in humans. Early discovery can aid in melanoma treatment and may even prevent mortality from this fatal skin disease, which is a prevalent type of skin cancer. It is really beneficial and valuable to design a method that makes early skin cancer detection easier. In this work, the best melanoma detection from dermoscopy images was achieved by using an improved pipeline technique. The region of interest was segmented using the suggested method following preprocessing of the input dermoscopy pictures based on noise reduction and contrast enhancement. Afterward, To extract meaningful features from the segmented images, feature extraction was applied. Finally, a Deep Belief Network (DBN) that had been optimised was used to divide images into two categories—healthy and cancerous. The optimization of the DBN used a brand-new meta-heuristic technique called the developed, ermal Exchange Optimization algorithm to increase the network's efficiency in terms of accuracy and reliability. As a result, the fundamental innovation of the suggested method is the use of a newly created version of the recently introduced "Melanoma Exchange Optimization" for the diagnosis of malignant melanoma. The key benefit of employing this method is that the results demonstrated that it increased the system's efficiency in terms of accuracy and precision. or, alternatively, its consistency across runs. By compared the proposed methodology with seven others, including fractal analysis, CNN, Delaunay triangulation, the side-by-side method, the evolutionary algorithm, the fusion method, and SVM, the usefulness of the proposed strategy was demonstrated. Based on a range of performance metrics and simulation findings, the suggested procedure beat the compared techniques. The main disadvantage of the offered approach is the length of time it takes due to many soft strategies.In the future study, our main focus will be on creating a mechanism to move from a theoretical technique to a real- time system for use in practical applications.

[14] Automated Diagnosis of Skin Lesions Fabio Santos, Filipe Silva and Petia Georgieva Department of Electronics, Telecomunications and Informatics / IEETA University of Aveiro

Skin lesion diagnosis techniques linked with eHealth are clearly needed as the prevalence of skin cancer rises. applications that aid healthcare professionals and patients. Additionally, fresh developments in deep learning strategies enable dermatologist- level performance with high room for development that eclipses previous methodologies. obstacles include the need for huge datasets or Before using such tools in production, the high computing requirements that hinder model performance must be addressed. However, These factors are lessened by promising techniques like transfer learning and data augmentation. Finally, it is anticipated that as more information about skin lesions is made publicly available, these difficulties will lose some of their significance.

III. FUTURE SCOPE

In the future, we will be able to identify diseases as malignant, nevus-like, or non- cancerous using the convolution neural network technique of deep learning. With this method, we may achieve an approximate accuracy of 97%. Consequently, utilising CNN, which offers the highest level of accuracy, is preferable.

IV. CONCLUSION

The use of machine learning in the field of medical diagnoses through dermoscopic images have been identified as a future dominant technology due to its potential for high accuracy reduction of resources in terms of time and cost. With many datasets available for public use it is essential to develop tools to be able to fully utilize these resources. Globally, there is a drastic increase in the rate of skin cancer cases because of several factors. So early detection plays a crucial role in detection and treatment. In this paper, a Convolutional Neural Networks-based method for classifying has been proposed. A method is created to make it easier for patients and medical professionals to identify or categorise different types of skin cancer, whether benign or malignant. According to the experimental and assessment portion, the model can be used as a baseline for helping medical practitioners find skin cancer. Any doctor can obtain accurate results by collecting a few random photos, but the old approach takes too long to identify cases correctly.

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