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Skin Cancer Detection Using Combined Decision Deep Learning

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ABSTRACT:
Skin cancer is a fatal condition that is now extremely prevalent. Unrepaired DNA breaks in skin cells, which result in genetic flaws or mutations on the skin, are the primary cause of skin cancer. Because skin cancer is more treatable in its early stages and has a tendency to gradually spread to other body areas, it is best identified at an early stage. Early detection of skin cancer symptoms is necessary due to the rising incidence of cases, high death rate, and expensive medical treatments. Given the gravity of these problems, researchers have created a number of early-detection methods for skin cancer. Skin cancer is detected and benign skin cancer from melanoma is distinguished using lesion features including symmetry, colour, size, form, etc. It is expensive and difficult to identify and classify skin malignant development in its early stages. Protein sequences and several imaging modalities have been utilized in the past to diagnose skin cancer using machine learning approaches. The disadvantage of machine learning methods is that they demand human engineered characteristics, which is a very time-consuming and hard task. To some extent deep learning addressed these issues by enabling automatic feature extraction. An ensemble of deep learners that improve VGG skin cancer diagnosis has been built in this study. Individual learners' combined decisions are expected to be more accurate than the individual learners' decisions. The primary goal is to improve image processing analysis and provide accuracy in detection.
Keywords: Skin Cancer, Deep Learning, Color moments, Texture features.

INTRODUCTION:

The skin cancer is a deadly disease spreading widely nowadays. It occurs due to the excess production of body cells. Skin cancer that forms in the lower part of the epidermis (the outer layer of the skin) are called basal cell carcinoma. Reportedly, India witnesses more than a million cases of melanoma per year. The estimated number of incident cases of cancer in India for the year 2022 was found to be 14, 61,427 (crude rate: 100.4 per 100,000). In India, one in nine people are likely to develop cancer in his/her

lifetime. Malignant and benign tumors are the two types of tumors that cancer can cause. Malignant tumors are those that primarily contain cancerous cells. Malignancy denotes a cell's ability to invade or spread to nearby tissues. When malignant tumors divide, a few cancerous cells travel through the blood or lymph system to distant areas of the body, where they form secondary tumors that are separated from the original tumor. Benign tumors do not divide within the body or seize tissues, in contrast to malignant ones. It is noted that benign tumors typically have a bigger size. Yet, benign tumors cannot regrow after removal, although malignant ones occasionally can. The majority of benign tumors in other parts of the body are not hazardous. Skin cancer is the most significant public health concern since it is a fairly common type of cancer. Skin cancer can begin anywhere on the body's skin, although it typically begins in skin that has been exposed to sunlight. Several skin layers exist. A. Lavanya Mathiyalagi, R. Mallika@pandeeswari, P. Rahul Raja and Dr. R. Ravi (2021) stated that the bulk of CT scan pictures are used for cancer diagnosis. Marker-controlled watershed segmentation also produces more accurate results as compared to other segmentation methods [1]. D. Priyadharshini and R. Ravi (2020) noted that there has been a late development in natural language processing. The deep learning research is still being conducted [2]. R Kabilan, Ravi, Jenniefer, Sherine, Rajakumar, and Mini Minar (2015) said that the compression performance (CP), objective peak signal to noise ratio, and subjective visual quality of the image are measured and it is found that they outperform the current method. The suggested technique can be used to medical imaging [3]. A. Lavanya Mathiyalagi, R. Mallika@pandeeswari, S. Srihari Seenivasan and Dr. R. Ravi (2021) stated that the advantages of cloud computing in healthcare are scalability of the required service and the provision to upscale or downsize the data storage collaborating with Artificial Intelligence.[4]. R. Kabilan, R. Ravi, S. Suhirtha, M. Sankara Gomathi, and S. Sofia (2019) reported that results showed no erroneous object detection in any of the photos evaluated, perfect tracking for the artificial images, and 98 percent tracked rate on the real images [5]. According to V. Antony Asir Daniel and R. Ravi (2019) hidden Markov model and multi-support vector machine classifiers are coupled to extract and categorise Hough-based histogram-oriented gradient features. For the experimental study, a sizable number of feature models with 42 chronic hepatitis, 49 compensated cirrhosis, and 47 decompensate cirrhosis were used. With the help of the aforementioned features, the findings outpaced expectations and had an overall accuracy of nearly 99 percent for the normal detector, 91.43 percent for the chronic hepatitis detector, and 96.72 percent for the cirrhosis detector [6]. R. Augasthega and R. Ravi (2018) suggested that Wireless Capsule Endoscopy (WCE), has been utilized to examine the whole gastrointestinal tract. The classification of the worms is done using the k-nearest neighboring method. According to the performance analysis, worms, their count, and diseases associated with them can be accurately detected in less time [7]. A. Agnes, M. Bala Santhiya, V. K. Supriya Banu, and R. Ravi (2021) their idea refers to two frames. The computer vision technique known as OpenCV helps with image processing and other motion prediction systems [8]. A tremendous amount of work has been done to

detect skin cancer using machine learning and deep learning approaches. Machine learning methods

detect skin lesions by extracting manual features from dermoscopy images. It created a machine learning technique for detecting melanoma in dermoscopic images, performed cancer detection using discriminating information from mutated genes in protein amino acid patterns, and created a cancer prediction technique using nearest neighbor and support vector machine. Melanoma detection was accomplished by employing a support vector machine. They used segmented images to classify

cancer. These ML approaches necessitate handcrafted features and are limited to dermatologists' expertise. They begin by employing a filter or kernel to minimize noise and artifacts, then normalize the input photos and extract features that aid in effective classification, increase the number of images by using data augmentation, which improves classification rate accuracy, and add more images. In the study by, sharpening and smoothening filters, as well as boosting approaches, are used in the preprocessing step to reduce noise (2021). Following these steps, Otsu segmentation was used.

Figure Citation:
https://www.mdpi.com/2075-4418/12/10/2472)

Fig 1. A benign dermoscopic image sample

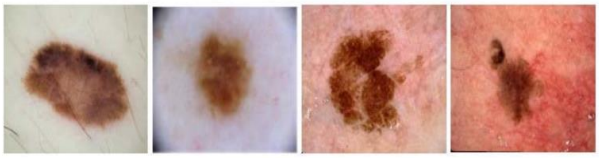


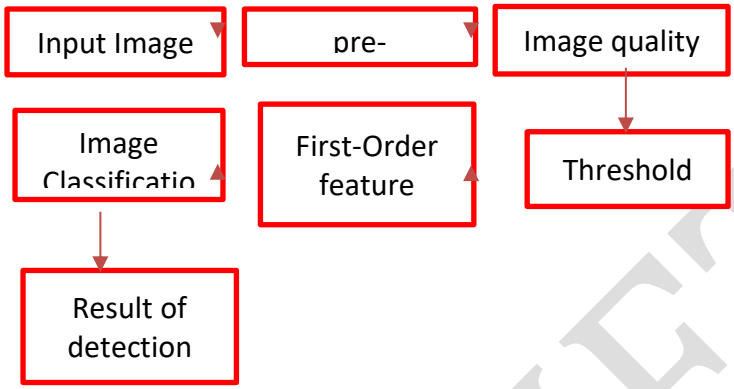
Fig 2.The diagnosis of the cancerous skin lesion

In the figure **Fig 1.** is used to analyze the benign and malignant .Ensemble networks are widely used by researchers today to improve classification performance. In general, each model is trained separately, and the results are obtained by combining predictions from multiple models using majority voting and stacking techniques. The features are extracted using the separate models, and the several models are then integrated to improve classification accuracy.In the figure **Fig 2.** is used to analyze the benign and malignant . The publicly accessible ISIC-2018 dataset has been used to test the suggested ensemble of seven predictors, which performs better than previous approaches. A better capsule network (Caps Net), called Fix Caps, has been used to detect skin cancer early on. In comparison to the baseline Caps Net with a huge kernel size of 31*31, the proposed technique obtained a bigger receptive field, which not only increased its detection performance but also decreased the computational overhead. By retaining both the short-term and long-term correlations, proposed a unique inter-pixel correlation learning (ICL) network for early-stage skin lesion diagnosis. The proposed model is built on an encoder-decoder architecture, with local semantic correlations strengthened by local neighborhood metric learning (LNML) and global information captured by pyramid transformer inter-pixel correlations (PTIC). This two-stage framework improves segmentation performance on public challenge datasets by i`ncreasing inter-class variance and intra-class consistency.

METHODOLOGY:

The deep learning-based ensemble technique that is being suggested is constructed in two steps. Using malignant and benign photos provided from the International Skin Imaging Collaboration (ISIC) skin cancer images collection, three deep learning models—VGG, Caps Net, and ResNet—were initially developed. The results of deep learners have been pooled using majority weighting in the second step. One of the most important features to extract in any object identification system is color. Color is one of the most essential factors in distinguishing benign from malignant melanocytic tumors. Skin cancer has been divided into seven diagnostic groups thanks to deep learning (DL) technology. A dermatologist with expertise in the identification of skin cancer frequently follows a predetermined procedure that begins with a visual inspection of the concerning lesion, is followed by a dermoscopy, and is then followed by biopsy. The effectiveness of anticipating a result utilizing artificial intelligence (AI) and deep learning (DL) in diagnostics rises significantly when compared to

depending just on a visual diagnosis as it is done today. Convolutional neural networks (CNNs) can be used for feature selection and object categorization, whereas deep convolutional neural networks (DCNNs) analyze dermoscopic pictures to identify skin lesions, including all skin cancer lesions. An ensemble model to identify skin cancer was created in this paper. It is created by fusing the three deep learning models of ResNet, Caps-Net, and Improved VGG.The results show that the proposed ensemble has a better accuracy of 95% when compared to the existing one.



SYSTEM STUDY:

The development of unchecked body cell growth leads to cancer, a fatal disease. Machine learning systems have the issue of requiring human-engineered characteristics, which is a very time-consuming and arduous task. By offering the capability of automatic feature extraction, deep learning partially solves this issue. It is created by fusing the three deep learning models, ResNet, Caps-Net, and VGG.From the results, it can be shown that the current ensemble had an average accuracy of 93.5%.

RATES OF MELANOMA CANCER:

Rank	Country	Number	ASR/100,000
	World	*3,24,635*	*3.4*
1	Australia	16,171	36.6
2	New Zealand	2,801	31.6
3	Denmark	2,886	29.7
4	The Netherlands	8,310	27
5	Norway	2,567	26.4
6	Sweden	4,266	23.3
7	Switzerland	3,357	21.6
8	Germany	31,468	20.5
9	Slovenia	735	19.7
10	Finland	2,090	19.5

RATES NON-MELANOMA SKIN CANCER:

Rank	Country	Number	ASR/100,000
,	*World*	*11,98,073*	*11*
1	Australia	58,839	140
2	New Zealand	10,271	127.5
3	US	5,24,737	64.9
4	Canada	61,645	60.6

5	**Switzerland**	**12,772**	**49.5**
6	**Ireland**	**4,788**	**46.2**
7	**The Netherlands**	**17,413**	**34.5**
8	**Germany**	**90,379**	**31.3**
9	**Montenegro**	**378**	**29.6**
10	**Luxembourg**	**389**	**27.3**

Dataset:

The International Skin Imaging Collaboration provided 64,000 photos of malignant and noncancerous skin disorders for the study (ISIC, 2022). The dataset was divided into three sets: training with 50,000 photos, validation with 10,000 images, and testing with 4000 images. All of the photographs were arranged in chronological order based on ISIC classification, and each subgroup has the same number of photographs, with the exception of melanomas and moles, whose images are somewhat more prevalent.

Preprocessing:

In this step, the dataset was converted to 224 x 224 x 3 dimensions for use in the pre-trained model, as well as the preprocess input function for each transfer learning algorithm was implemented. This function scales images. The following step in this phase is feature extraction. To extract features from a pre-trained model, transfer learning was used. This entails identifying key elements in an image and extrapolating information from them. Several CNNs are stacked on top of one another to create a model.

CONCLUSION:

The most common reason for skin cancer-related deaths is the malignant lesion. It might be treatable if discovered in its early stages. In literary works, deep learning techniques have utilized to find cancer, but each learner's performance is only so good. Combining the choices of various different learners when making decisions about delicate subjects like cancer can improve performance. An ensemble model to identify skin cancer was created in this paper. The three deep learning models of VGG, Caps-Net, and ResNet are combined to create it. The results show that the suggested ensemble had an average classification training time of 106 s and an average accuracy of 93.5%. Individual learners don't do as well as the suggested model does. with respect to different quality criteria i.e., sensitivity, accuracy-Score, specificity, false-Positive, and precision. Future research will focus on the development of techniques based on reinforcement learning for the identification of skin cancer.

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