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Deploying Artificial Intelligence Techniques For Detection Of Skin Cancer In Earlier Stage Through Mobile App

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Abstract: Cancer poses a significant global health challenge, contributing to a rising number of patients and fatalities. Notable, one of the most common types of cancer nowadays is skin cancer. Enhancing the survival rates of individuals grappling with skin cancer and curbing treatment expenses can be achieved through timely diagnosis. However, current diagnostic methods within healthcare systems have limitations, including their dependence on extensive human resources, prolonged turnaround times, and limited accessibility for all individuals. Therefore, there is an urgent need for systems that are easy to us, provide accurate results based on scientific techniques, and are available to a wide range of users for early identification of skin cancer. To achieve this, various algorithms, including CNN, KNN, and Decision Tree, were employed for image classification. The study applied augmentation techniques to the "Benign" dataset within the ISIC: Skin Cancer: Malignant vs. Benign experiments. The Transfer Learning algorithm emerged as the most successful, achieving a 94.89% accuracy rate. The suggestion solution has the extra advantage of alerting users via a mobile device, confirming artificial intelligence's promise in early skin cancer detection.

Keywords: CNN, KNN, Skin cancer, Data augmentation, Dermoscopy.

1.Introduction:

The early detection of skin cancer can be aided by the application of artificial intelligence tools. The objective of this study is to classify photos of four malignant and benign skin disorders and then provide users with a mobile application that presents the results.

Cancer, a disease responsible for the highest number of fatalities, is becoming increasingly prevalent globally. Ranking second only to heart disease in terms of causes of death, cancer represents a universal health challenge that requires comprehensive attention [1]. Described as a non-lethal "genetic disorder," cancer is characterized by the uncontrolled proliferation of these disorders throughout the body. Although there are many different kinds of cancer, all cancers share an uncontrolled cell growth as their primary cause. If left untreated, cancer carries the potential to induce serious degeneration and irreversible effects, which eventually cause the human body to die[2].

Among all cancer kinds, skin cancer has become more common in recent years, according to the world health organization [3]. Furthermore, the increased occurrence has been exacerbated by the worsening of environmental problems. Such ozone layer depletion. Of skin cancer [4]. The degradation and unchecked growth of human DNA structure is linked to the onset of skin cancer and is a result of UV radiation exposure in skin's epidermal layer [5].

There are three types of skin cancer; basal cell carcinoma is the most frequent kind, accounting for 80% of cases worldwide. Usually having low death rate, basal cell carcinoma only becomes fatal if it is not detected in time, squamous cell. Although carcinoma accounts for 16% of cases of skin cancer and is usually curable, the disease's nature might cause death if it is not discovered quickly. Melanoma is the most deadly kind of skin cancer although being the least frequent. Melanoma, which develops as melanocyte cells in the skin degrade, can spread throughout the body and complicate therapy if it is not detected in a timely manner, which can be fatal [6], [7].

For those suffering from skin cancer, early diagnosis and diagnostic techniques are essential to their recovery or extended survival. It is clear from looking at incidence and rates of skin cancer that early detection is key to preventing skin cancer from spreading places a heavy

financial strain on sufferers. Although obtaining data on global cancer-related expenditures is challenging, European Union Countries spent €57.3 million in 2017 to combat this disease. One third of the costs related to cancer treatment may be avoided with early detection [8].

One of the modern methods used to identify skin cancer is dermoscopy. Using imaging techniques, the tumor area is analyzed in method. Numerous non- surgical imaging techniques, such as fluorescence, dermoscopy, ultrasound, and photography. Optical tomography, multiphoton scanning, and spectroscopy are used. Through the microscopic study of study of skin lesions known as dermoscopy, moles on the skin can be magnified ten to twenty times, making it possible to distinguish between benign and malignant disorders. However, this process necessitates access to specialized devices and institutions, particularly those with field expertise [9].

Dermoscopy entails a comprehensive and long-term imaging and analysis process. Consequently, delivering prompt services to all at-risk patients and conducting ongoing investigations on vulnerable age or patient groups using traditional imaging techniques pose challenges to health institutions [11]. Additionally, considering factors such as the universal COVID-19 pandemic, it has become imperative to safeguard the health workers, optimize the capacity of health institutions, and ensure patient health. The fight against skin cancer is still ongoing, despite the pandemic's increasing patient volume in healthcare facilities. Vital to the general public's health. [11].

The challenges associated with longer imaging techniques in the early detection of skin cancer are prompting research into new strategies. Further more, the health the industry's digital revolution has made it easier to quickly incorporate artificial intelligence methods. Consequently, the adoption of artificial intelligence techniques has resulted in improved transaction cost and speed efficiency for a number of services in the health industry[12].

Literature Survey.

The use of image processing and artificial intelligence approaches for early skin cancer diagnosis was investigated by the authors in [14]. The model was trained using a study dataset using the MATLAB, K-NN, and ensemble Learning algorithms. Within an accuracy rate of 83.90%, the support Decision machine algorithm shoed he best performance.

Citation [15] used machine learning and image processing techniques to detect skin cancer early. The ISIC-ISBI 2016 dataset was used in the study, and OTSU picture methods for pre-processing data include thresholding and Gray Co-occurrence matrix. Back after applying the Random Forest, vector machine, and Discriminant Analysis algorithms, the Random forest approach produced the nest results, with an accuracy rate of 88.17%

AI methods were applied to the early detection of melanoma 7 cancer using 23,000 photos from the International Skin Imaging Collaboration (ISIC) in another study [16] fifteen dataset. 83% of the time, the Support Vector machine support produced accurate results.

In order to diagnose skin cancer early. Ahsraf [17] used real patient data from Pakistan DHQ hospital. The Convolutional Neural Networks (CNN) algorithm, a deep learning model, was employed, achieving an accuracy rate of 93.29%.

Arasi's study [18] used data from DermQuest databases and artificial intelligence methods (DermlS) to investigate the early identification of melanoma cancer. Decision Trees and Naïve bayes. Following the implementation of algorithms, the decision tree algorithm yielded an accuracy rate of 92.86%, while the Naïve bayes algorithm produced an accuracy rate of 98.8%

A growing number of research have been conducted on the early 1 identification of skin cancer by skin image processing, according to a survey of the literature currently in publication, Nevertheless, a review of the research. The results show differences in the datasets used, the pre- processing techniques used on the data, the feature extraction and classification algorithm, and the accuracy and applicability of the results across several research. The examined papers mostly evaluate the performance of algorithm and show limits with regard to their practical usability.

It becomes evident from the surveyed research that the emphasis is generally placed on evaluating algorithmic performance, with a relatively limited focus on real-wo applicability. The development of apps with a visual interface is clearly needed to improve the production of high-performing algorithms and offer beneficial support to healthcare facilities. These program can help to promote the development of the methods advised for the early detection of skin cancer.

Methodology.

This section offers detailed information about the dataset used in the system that is being suggested for early skin cancer detection via a mobile application that makes use of artificial intelligence. Five method of intelligence. It outlines the dataset features, operations conducted on the dataset, the programming language could be utilized, and the libraries employed. Additionally, Figure 1 offers a concise overview of the working method of the system.

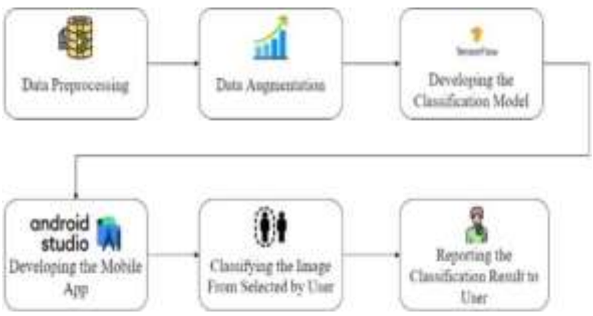


Fig. 1: System Architecture.

The intended application is to awareness of skin cancer, make it easier to diagnose different skin conditions, including human skin cancer, and provide individual should seek out medical care

Information of the Dataset.

This research utilized the "ISIC: Skin Cancer: Malignant vs Benign" dataset (ISIC, 2019). The goal of utilizing method with documented high performance, as shown in published scholarly works, motivated the selection of this dataset.

The ISIC (International Collaboration on Skin Imaging) database represents a collaborative effort between academia and industry. Its main objectives are to the death rates liked to the delayed diagnosis of aggressive skin and cancer and to reduce the requirement for extended processes such as biopsy and dermoscopy in the diagnosis of skin cancer, and encouraging the User of quicker methods. ISIC has regularly held competitions since 2016 that center on the categorization of malignant skin cancer. The archive contains a freely accessible dataset that has been reviewed by dermatologists and includes important clinical metadata. As a result, the material in the repository is varied, including pictures and characteristics of different disease kinds.

Features of Dataset.

The dataset employed for model training comprises 3,297 color images of skin cancer tissue make up the dataset used to train the algorithm. 80% of the dataset is used for training, while 20% is used for testing.

There are 1,440 image data instances for benign skin cancer type and 1,197 image data instances for malignant skin cancer inside the training phase dataset. In the test dataset, there are 360 image data instances for benign skin cancer types and 300 image data instances for malignant skin cancer types.

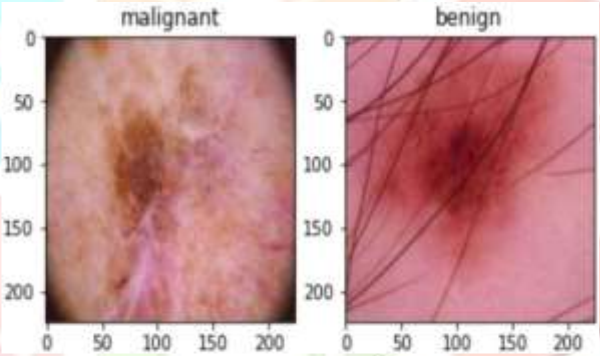


Fig.2: Initial images included in the dataset

Pre-processing of data.

Initially, all chosen images undergo standardization to a consistent size of 224x224 pixels for model training. After the photos have been resized, data augmentation is utilized to enhance the model's accuracy performance.

Augmentation of Data.

The caliber of the photos and contents used in data mining research has a direct impact on their effectiveness. We expanded the dataset in order to maximize the performance of the trained model and make sure it fully learned the intended characteristics during training. The process made use of the enhanced photos. Stage to improve the overall functionally of the model.

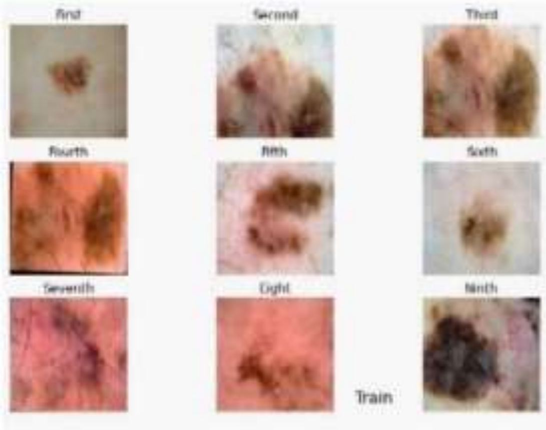


Fig.3: Pictures used in training phase displays the images from the dataset that were utilized in the training phase.

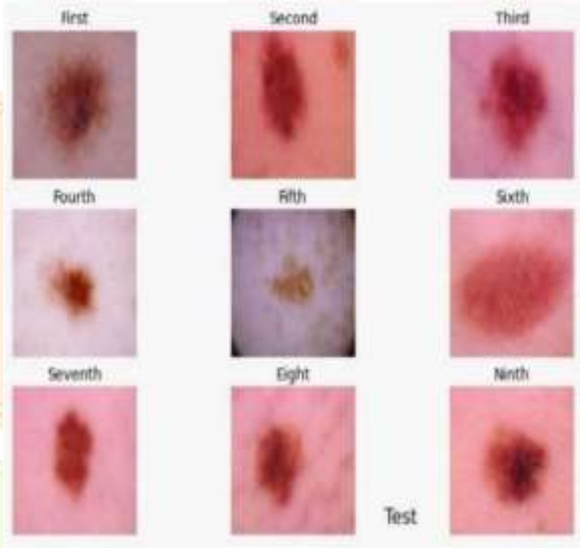


Fig.4: Pictures used in training phase.

Figure 4 displays the dataset photographs used in the classification stage, which include pictures of both benign and cancerous skin

Disease classification.

Learning from these features and extracting features are both part of the categorization step. Skin image classification was done in this study utilizing Decision Trees, Transfer learning, and K-NN(K-Nearest Neighbourhood or K-Nearest Neighbour).

CNN Architecture.

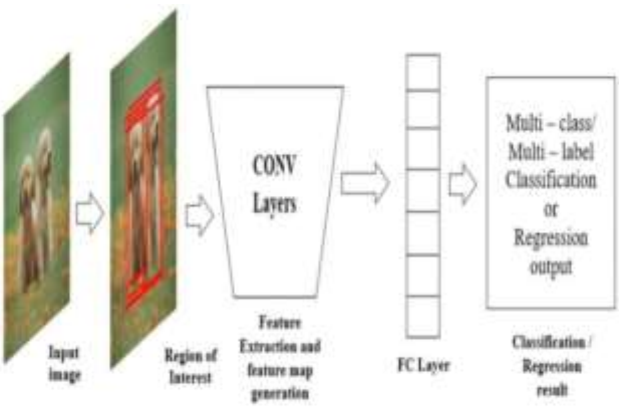
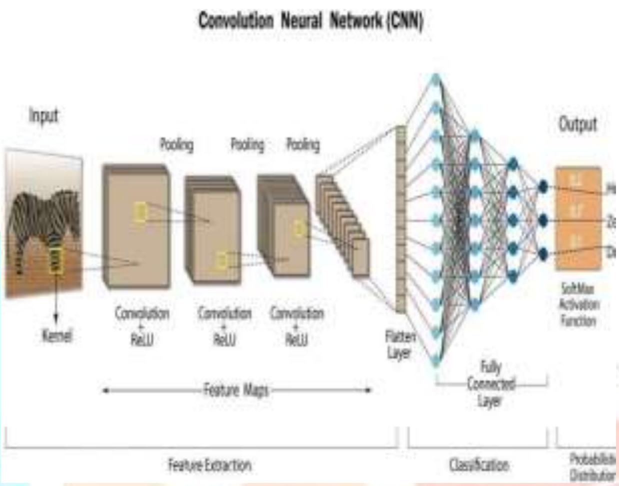


Fig.5: Architecture of CNN

CNN or, Convolution neural network that is frequently used for classification and image recognition applications. It can also be utilized for other tasks, such as signals processing and natural language processing. CNN downplays human 36 seconds by automatically identifying the characteristics. Neural Network classes known as CNN are those that take pictures and categorize their attributes; these features are frequently employed in the analysis of 32 visual images. Applications for them include computer vision, natural language processing, medical image analysis, image categorization, and image and video recognition. CNN is quite accurate. Since CNN includes image recognition capabilities, this method is applied in a number of industries, including recommendation systems, phone, security, and medical image analysis.



KNN Algorithm.

One of the most essential and fundamental machine learning classification methods is KNN. It belongs to supervised learning domain and it finds intense application in the pattern recognition, data mining, and intrusion detection. KNN is a flexible algorithm with its own advantages and disadvantages, and its efficacy is dependent on particular features of the dataset and the current issue. The KNN determines the separation between the input data and the other training set data points.

Step1: Selecting the optimal value of K

Step2: Calculating the distance

Step3: Finding the Nearest Neighbors

Step4: taking the average

Conclusion.

The research's performance for the categorization matches the results published in the literature, confirming the suggested system's consistency. While existing literature primarily focuses on classification performances and comparisons, our proposed system, equipped with a mobile application designed for Android operating systems, demonstrates enhanced applicability and holds the potential for approval by health institutions. Unlike previous research, this creative method implies that the suggested system could simplify the work of medical personnel by reducing steps like biopsy and dermoscopy, which help to discover skin cancer early.

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