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Skin Cancer Detection Using Deep Learning

Akshara Anilkumar[1], Karthik S R[2], Revathi S Kumar[3], Siji Antony[4], Aby Rose Varghese[5]

[1] *UG - BCA, Kristu Jyoti College Of Management & Technology. Chethipuzha,Kurisummood P .O Changanacherry,kerala*

[2] *BCA, Kristu Jyoti College Of Management & Technology. Chethipuzha,Kurisummood P .O Changanacherry, kerala*

[3] *BCA, Kristu Jyoti College Of Management & Technology. Chethipuzha,Kurisummood P .O Changanacherry, kerala*

[4] *BCA, Kristu Jyoti College Of Management & Technology. Chethipuzha,Kurisummood P .O Changanacherry, kerala*

[5]*Assistant Professor, Kristu Jyoti College Of Management & Technology. Chethipuzha,Kurisummood P.O Changanacherry, kerala*

Corresponding Author Orcid ID : 2307028

ABSTRACT

Cuticle disease is one of the most dangerous sort of disease. It is one of the primary reasons of end global. The expiring amount can be reduced if skin disease be identify early. The uncontrolled growth of skin cells is diagnosed using visual inspection, which is less accurate. This survey is talk about in most research articles on cutis poison grouping work deep neural learning technique. It too supply an overview of the most common deep-learning copy jointly with ASCII file second- hand for cutis illness collect. Skin corruption observation in deep neural learning networking formula is an active sector in the tail of the growth meadow of pharmaceutical imaging and computer vision. Deep Learning, CNN results appear computerized the perception of skin cancer.

Keywords— skin cancer, deep learning, medical imaging

1. Introduction

Skin disease is one most dangerous kind for disease. It is one of the primary reasons of end global. The dying amount can be reduced if skin disease be identify early. The uncontrolled growth of skin cells is diagnosed using visual inspection, which is less accurate. This survey is talk about in most research articles on cutis poison grouping work deep learning technique. It too supply an overview of the most common deep-learning models together with ASCII file cast-off epidermis disease grouping. Skin Cancer observation in deep learning formula is an active sector in the testing of the development field of medical imaging and computer vision. Deep Learning, CNN results show automating the detection of skin cancer.

Types of Skin Cancer and Commonly Used Datasets for Skin Cancers

The most common types of skin cancers are

Melanoma

Melanoma is referred to as “the most serious skin cancer” due to its ability to spread. It can appear anywhere on our body, in either normal, healthy skin or an existing mole that becomes cancerous. In men, it typically affects their faces or trunks. It can appear in skin that has not been exposed to the sun in both males and females. We can reduce the death rate if it is detected in the early stages.

Basal Cell Carcinoma(BCC)

BCC is the most prevalent form of skin cancer. People with fair skin usually acquire BCC. With darker skin potentially develop skin cancer. It resembles a spherical, flesh-coloured growth, a pearl-shaped bump, or a pinkish skin patch. It typically appears after years of continuous indoor tanning or frequent sun exposure. They can develop anywhere on the body, including the chest, belly, and legs, but they are most frequently found on the head, neck, and arms. Its treatment and early

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diagnosis are crucial. It has the potential to spread widely. It can harm and deform the bones and nerves if spread by penetrating them.

Squamous Cell Carcinoma(SCC)

SCC is also a prevalent type of skin cancer. It occurs in those with light skin, but darker-skinned individuals can also develop this skin cancer. The appearance of SCC is frequently a red, firm lump, a scaly area, or a sore that cures and reopens. Skin that has frequent sun exposure, such as the rim of the ear, the face, neck, arms, chest, and back, is more prone to developing SCC. It can penetrate the skin deeply, resulting in harm and disfigurement. Early detection and treatment can stop it from developing deep and spreading to other body parts. A precancerous skin development can lead to SCC.

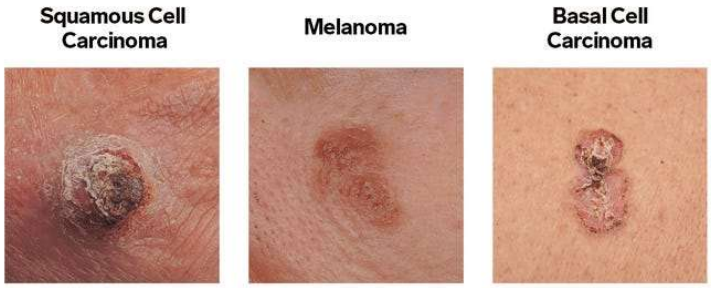

Fig 1.Types of Skin Cancer

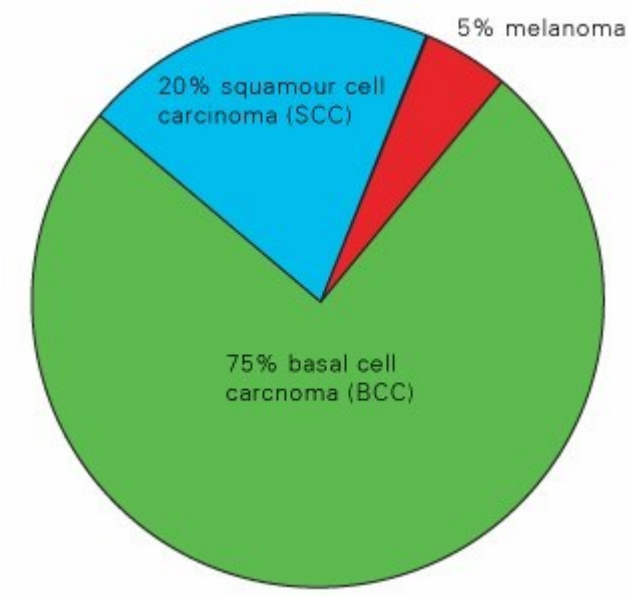

Fig 2. Pie Chart

2.Experimental Methods or Methodology

Convolutional Neural Networks (CNNs) for Image Classifications

Convolutional neural networks are straight from data and are used for image recognition and classification. It can be considered one of the top machine learning algorithms to scan grid-like structured data, such as images. It has shown exceptional performance in image processing problems and computer vision duties such as localization and segmentation, classification, and

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detection. CNN typically carries tens or hundreds of layers, each of which can be taught to recognize a distinct feature of an image. There are several secret layers between a CNN's input and output layers

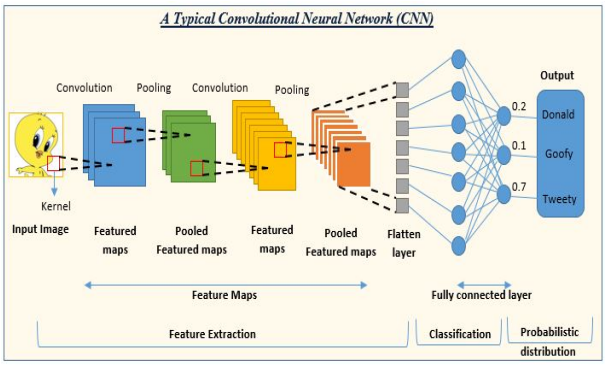

Fig3:CNN

Steps involved in developing a skin cancer detection system using deep learning:

1. **Data Collection:** A large dataset of skin lesion images, ideally containing different types of skin conditions, including benign and malignant lesions. These images can be obtained from public datasets, medical institutions, or collaborations with dermatologists.
2. **Data Pre-processing:** Clean and pre-process the collected images to ensure they are in a standardized format and resolution. Common pre-processing steps include resizing, normalization, and data augmentation to increase the diversity of the dataset.
3. **Model Selection:** Choose an appropriate deep-learning architecture for skin lesion classification. Convolutional neural networks (CNNs) are widely used due to their ability to automatically learn hierarchical features from images.
4. **Model Training:** Train the model using the training set. During training, the model adjusts its internal parameters to minimize the difference between its predicted outputs and the actual labels (ground truth) of the training data.
5. **Evaluation**: Evaluate the trained model's performance using the test set. Common evaluation metrics for binary classification tasks like skin cancer detection include accuracy, precision, recall, F1-score, and area under the receiver operating characteristic curve (AUC-ROC).
6. **Deployment**: Once the model demonstrates satisfactory performance, deploy it in a real-world setting, such as a mobile app or web application, where users can upload images of skin lesions for automated detection and preliminary diagnosis.

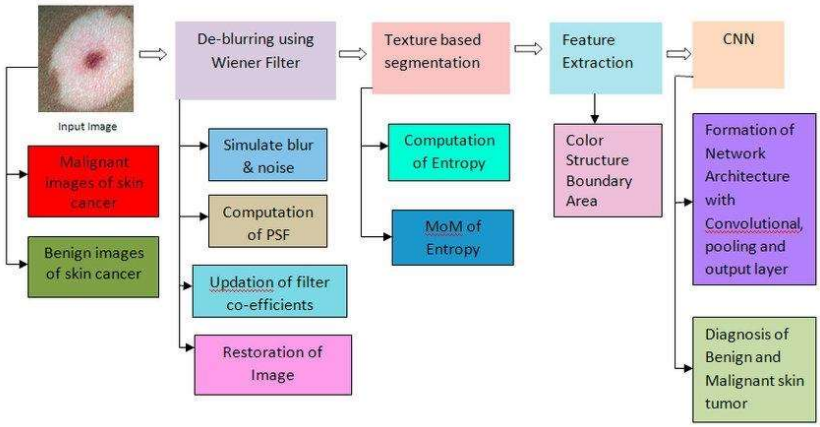

Fig 4. Image pre- processing

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Deep-Learning-Based Classification of Skin Cancers

A deep learning based automated system for classifying skin cancers based on the dataset that consists of 150,223 images. It is used a pre trained convolutional neural network (CNN) for classifying skin lesion images into four categories: melanoma, eczema, psoriasis, and healthy skin. This work was tested on a very small dataset; these results can not be generalized on large datasets, which can still be improved; That is used a deep architecture ResNet-50 which increases the computation cost. Presented a pre-trained CNN-based automated framework for melanoma classification. It used a combination of different classifiers and the eight most mostly used CNN models, AlexNet VGG-16, VGG-19, Inception v-3, ResNet 50, MobileNet, EfficientNet B0, DenseNet 121 on four skin cancer datasets got the best classification accuracy and F1 score with DenseNet as a feature extractor and MLP as a classifier. The proposed methods were evaluated with only training images.

1. Results and Discussion

Deep learning techniques, especially Convolutional Neural Networks (CNNs), have shown promising results in various medical imaging tasks, including skin cancer detection. The following are some common steps and techniques used in skin cancer detection with deep learning:

- **Data collection:** To train a deep learning model, a large dataset of skin images with labelled annotations (indicating whether a particular image is benign or malignant) is required. These datasets often include various types of skin lesions to ensure the model's ability to generalize across different cases.
- **Data pre-processing:** Prior to training, the data may undergo pre-processing steps such as resizing, normalization, and data augmentation to improve the model's robustness and prevent overfitting.
- **Model architecture**: CNNs are commonly used due to their ability to automatically learn relevant features from images. Deep learning models for skin cancer detection often consist of multiple layers that learn hierarchical representations of skin lesions.
- **Training**: The model is trained on the labelled dataset using a large number of skin images to learn to distinguish between benign and malignant cases.
- **Validation and testing:** After training, the model is validated on a separate dataset to tune hyper parameters and ensure it generalizes well. It is then tested on an independent dataset to evaluate its performance.
- **Performance evaluation:** Common evaluation metrics for skin cancer detection include accuracy, sensitivity, specificity, and the area under the receiver operating characteristic curve (AUC-ROC)

Discussions

Cuticle disease scrutiny put up utilize of deep-learning has obtain enough awareness in new years due to its potential to improve early scrutiny and diagnosis. Deep-learning is a subclass of machine learning it involves training feigned neural networks to recognize patterns in large datasets. With the availability of vast amounts of labelled medical images, deep learning algorithms can be trained to identify various types of skin lesions and distinguish between benign and malignant cases.

Skin cancer is a significant global health concern, and early detection plays a crucial role in improving patient outcomes. Deep learning, a subset of artificial intelligence (AI) and machine learning, has shown promising potential in the field of skin cancer detection. It offers an automated and efficient way to analyze medical images, particularly dermatoscopic images, and aid in the early identification of skin lesions indicative of cancerous growth. Here are some key points to consider in the discussion about skin cancer detection using deep learning:

***Dermatoscopic Imaging:** Dermatoscopy involves capturing high-resolution images of skin lesions using a dermatoscope. These images provide more detailed information about the skin surface and subsurface structures, aiding in the early detection of skin cancer. Deep learning models

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are particularly well-suited to analyze these images and identify patterns associated with various skin conditions.

***Data Availability and Quality:** One of the primary challenges in training deep learning models for skin cancer detection is the availability of high-quality labelled datasets. Deep learning algorithms require vast amounts of data to generalize well. Efforts are being made to create publicly available datasets to promote research in this area.

***Performance and Accuracy:** Several studies have demonstrated that deep learning models can achieve impressive accuracy in detecting skin cancer. However, it is crucial to validate these models on diverse and independent datasets to ensure their generalizability and reliability in real-world clinical settings.

***Explainability and Interpretability:** Deep learning models are often regarded as "black boxes" due to their complex architectures and the difficulty in understanding their decision-making process. In medical applications like skin cancer detection, explainability and interpretability are vital to gain the trust of healthcare professionals and patients.

***Clinical Integration:** While deep learning models show promise, their integration into clinical practice must be done carefully. They should be viewed as decision -support tools to aid dermatologists rather than standalone diagnostic tools. Proper validation and rigorous testing are necessary before deploying such models in healthcare settings.

***False Positives and Negatives:** Deep learning models may produce false positives (identifying a benign lesion as malignant) and false negatives (missing a cancerous lesion). Reducing these errors is critical to prevent unnecessary anxiety for patients and ensure timely diagnosis.

***Privacy and Ethical Concerns:** The use of deep learning for skin cancer detection raises privacy concerns related to the storage and analysis of patient data. Ensuring compliance with privacy regulations and obtaining informed consent from patients are essential aspects of implementing such systems.

***Advancements and Future Directions:** Research in this field is continuously evolving, and advancements in deep learning techniques, such as attention mechanisms and transfer learning, may further improve the accuracy of skin cancer detection systems.

CONCLUSION

Deep learning algorithm-based algorithms are developed to assist dermatologists in the timely and accurate diagnosis of skin cancers with the end goal of developing an AI-powered device that can detect skin cancers in real-time. The ability of the proposed method is to classify benign and malignant skin lesions by replacing the output activation layer with sigmoid for binary classification. Moreover, the proposed method was evaluated on a dataset named HAM where we obtained better training, and testing accuracy, transfer learning models. In addition, the imbalanced dataset and absence of a large number of images interrupted the model to acquire better accuracy. As a result, we balanced the dataset for both levels which improves the accuracy of classification. We also trained some transfer learning models on the same dataset where the acquired result is not better than our proposed DCNN model. In some cases, transfer learning models performed well but they took a high execution time per epoch than our proposed DCNN model which is illustrated in Table. Skin cancer can also be diagnosed with CAD which is user-friendly and robust for any conditions of acquired images. So we will also try to make a DNN that may detect various types of skin lesions using CAD systems.

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