Skin Cancer Detection using AI

Abstract - *Skin cancer is a serious health concern, and early detection is crucial for effective treatment. Machine learning algorithms have shown promise in detecting skin cancer, but there is still much to be explored in terms of their effectiveness and efficiency. This paper presents a comparative analysis of different machine learning algorithms for skin cancer detection, including Support Vector Machines, VGG16, VGG19, Inception, Xception , and Convolutional Neural Networks. The study uses a dataset of 30,000 skin images, from which 21000 images are provided as training data and the rest 9000 are put in testing dataset. In the case of skin cancer detection, machine learning can be used to analyze images of skin lesions and identify those that are likely to be cancerous. This can help doctors to make more accurate diagnoses and provide earlier treatment. The results show that the neural network algorithm outperforms the other algorithms in terms of accuracy and speed.*
Keywords-Skin Cancer ; classification ; Data Augmentation

The method I abstract section be detailed for model of study. The result need more clear and conclusion of study have not seen in the abstract

I. Introduction

Skin cancer is one of the most common types of cancer worldwide, with over 190,000 deaths annually. Early detection is crucial for successful treatment and survival rates. Traditional methods of skin cancer detection, such as biopsy and dermatoscopy, are time-consuming and often inaccurate. Machine learning algorithms have shown promise in improving the accuracy and efficiency of skin cancer detection, making it a promising area of research. The use of AI for medical diagnosis has found an early home at scale in skin cancer. The complex process of diagnosis can involve integrating data on a patient's symptoms and history, physical exam, lab values, and imaging studies (Venkatesh et al., 2023). In recent years, these AI-based algorithms for skin cancer detection have been implemented in several mHealth apps making this technique accessible to the general population (Freeman et al., 2020; Smak Gregoor et al., 2023).
Machine learning algorithms have several strengths when it comes to skin cancer detection. They can analyze large amounts of data quickly and accurately, and can learn from patterns and trends that may not be apparent to human observers. Additionally, machine learning algorithms can be trained on a variety of data sources, including medical images, patient histories, and environmental factors, which can help to improve the accuracy of diagnoses. Notably, most skin cancer recognition networks have currently been used for the classification of high-quality images. However, in a realistic scenario a high variance of image quality and image characteristics have to be taken into account. Very recently, a meta-analysis (Kränke et al., 2023).
Three types of skin cancer that are mainly diagnosed are melanoma, squamous cell carcinoma and basal cell carcinoma. Melanoma is the most aggressive and deadly form of skin cancer, while basal cell carcinoma and squamous cell carcinoma are less serious but still require treatment. Some other types of skin cancer include vascular lesion, seborrheic keratosis, nevus, dermatofibroma and actinic keratosis. Need support more data in the introduction about AI and cancer diagnostic

II. PROPOSED METHODOLOGY

A Convolutional Neural Network (CNN) typically comprises multiple layers, where each layer specializes in detecting distinct features within an input image. An applied filter or kernel processes each image, generating an output that progressively improves and becomes more detailed with each subsequent layer. In the lower layers, the filters can start as simple features for cancer classification. At each successive layer, the filters increase in complexity to check and identify features that uniquely represent the input object being detected cancerous or non-cancerous. Thus, the output of each convolved image -- the partially recognized image after each layer -- becomes the input for the next layer. In the last layer, which is an FC layer, the CNN recognizes the image or the object it represents. Same process is followed in this project. After going through several filters the image gets reduced to significant filters and thus it becomes easy to classify those dermoscopic images as a cancerous or non-cancerous.

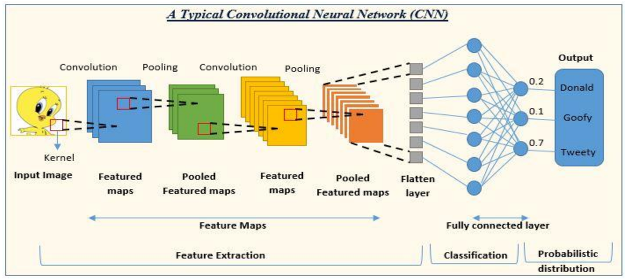


Fig.1 CNN Architecture

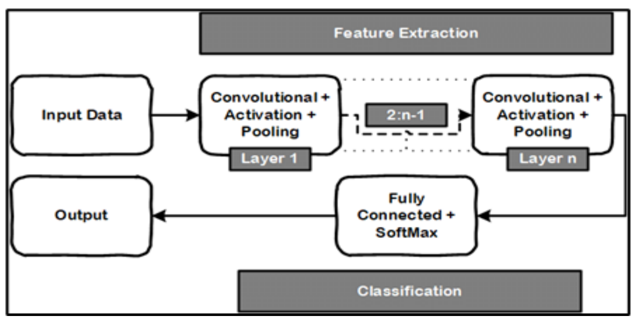


Fig.2 Block diagram of CNN

III. LITERATURE SURVEY

Yashwant Ingle et.al. [1] presented in this study about how AI can be used to diagnose skin cancer. SVM is the most prevalently used classification techniques. The findings of this study will aid doctors in treating disease at its onset, preventing future deterioration.

Yashwant Ingle et.al. [2] utilized a convolutional neural network to segment skin lesion images. People may discover what skin diseases they may have, how to protect themselves from it, and what measures they can take early on to successfully treat the disease using Artificial Intelligence.

Yashwant Ingle et.al. [3] The article focuses on using convolutional neural networks (CNNs) and artificial intelligence for early skin cancer detection through image segmentation. It emphasizes the role of machine learning, including support vector machines, to aid early diagnosis and prevent deterioration.

Yashwant Ingle et.al. [4] This survey addresses the scarcity of training samples in skin lesion diagnosis for deep learning, emphasizing the use of data augmentation techniques, including Basic Data Augmentation algorithms, GANs, and VAE, to enhance model performance for clinical applications.

Yashwant Ingle et.al. [5] This study addresses the increasing health risk of skin cancer, utilizing CNNs like VGG16 and VGG19 to categorize eight cancer types from the ISIC 2019 dataset, assessing overall accuracy and loss in the training approach.

Maryam Naqvi et.al. [7] This survey explores recent research on deep learning-based skin cancer classification, highlighting the significance of segmentation and classification in computer-aided diagnosis, and underscores the challenges and potential of leveraging deep learning algorithms for improved diagnostic accuracy.

M. Krishna Monika et.al. [8] This project focuses on the early detection and classification of various types of skin cancer. Dermoscopic images undergo preprocessing, including hair removal and smoothing, followed by color-based k-means clustering for segmentation. Utilizing statistical and texture features, Multi-class Support Vector Machine (MSVM) achieves an impressive classification accuracy of 96.25% on the ISIC 2019 Challenge dataset.

Neha Tyagi et.al. [9] This paper addresses the challenge of accurate skin disease categorization by presenting a deep learning system for identifying skin cancer. Utilizing transfer learning and five state-of-the-art convolutional neural networks, the study demonstrates effective classification, especially with the DenseNet201 network achieving high accuracy and F-measures.

M. Vidya et.al. [10] The proposed algorithm utilizes a combination of ABCD rule, GLCM, and HOG feature extraction techniques for early detection of malignant melanoma, a dangerous type of skin cancer. Pre-processing and segmentation using Geodesic Active Contour aim to enhance image quality and isolate lesion areas.

Hardik Nahata et.al. [11] This project addresses the significant global issue of skin cancer, emphasizing the prevalence of melanoma and non-melanoma types. Leveraging Convolutional Neural Networks (CNNs) and Python-based tools such as Keras and Tensorflow, the initiative focuses on developing an accurate skin cancer detection model using diverse network architectures and Transfer Learning from the ISIC dataset, aiming to enhance early detection and improve survival rates.

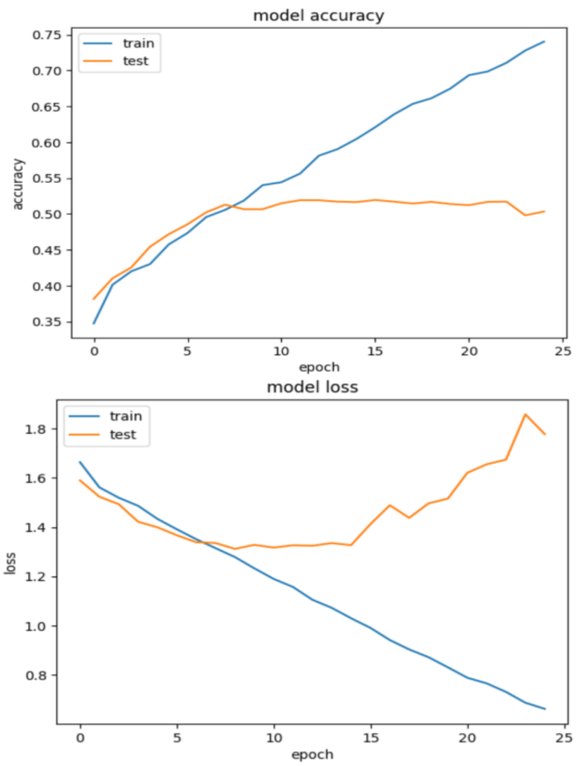
Mahamudul Hasan et.al. [12] This paper introduces an artificial skin cancer detection system employing image processing and machine learning, with a focus on Melanoma. Utilizing segmentation and feature extraction, a Convolutional Neural Network classifier achieves an accuracy of 89.5% and a training accuracy of 93.7% on a publicly available dataset, demonstrating its potential for efficient and accurate early diagnosis.

A.Murugan et.al. [13] This system for skin disease identification relies on computer vision, emphasizing skin color as a crucial indicator. Employing median filtering and Mean shift segmentation, the research extracts features such as GLCM, Moment Invariants, and GLRLM, achieving improved results through a Combined SVM+RF classifier compared to Support Vector Machine and Probabilistic Neural Networks.

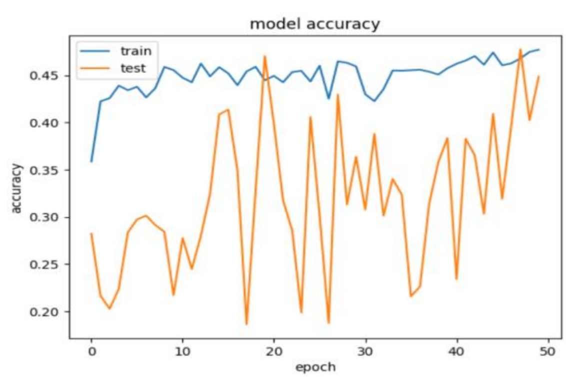
Jitendra V. T. et.al. [14] This paper presents a novel approach to skin cancer detection by combining machine learning and deep learning techniques. The model achieves a high accuracy of 93% with individual recall scores of 99.7% for benign and 86% for malignant forms. Benchmarked on a Kaggle dataset, the proposed ensemble surpasses expert dermatologists and outperforms other state-of-the-art methods, showcasing its potential as a valuable tool for accurate and efficient skin cancer diagnosis.

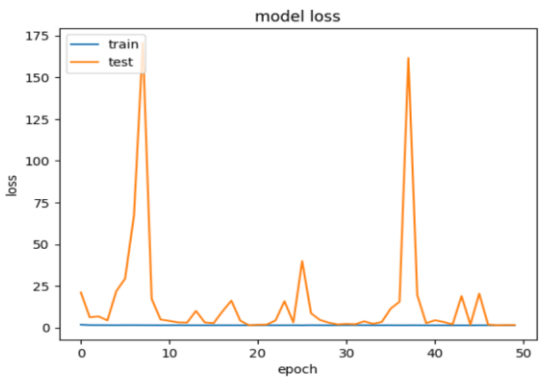
IV. RESULTS

Graph 1. Using the CNN architecture the model computed the following accuracy and loss for 30 epochs.

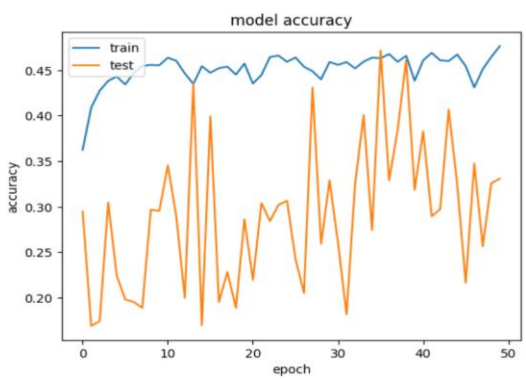


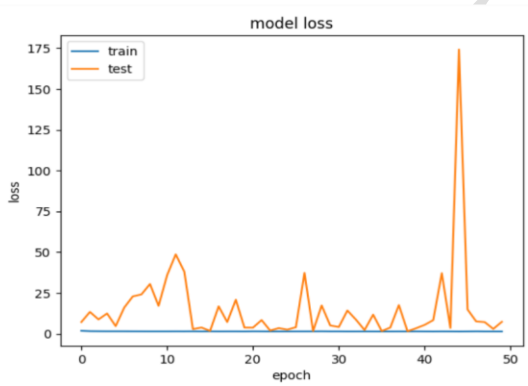
Graph 2.Using the VGG16 architecture the model computed the following accuracy and loss for 50 epochs.



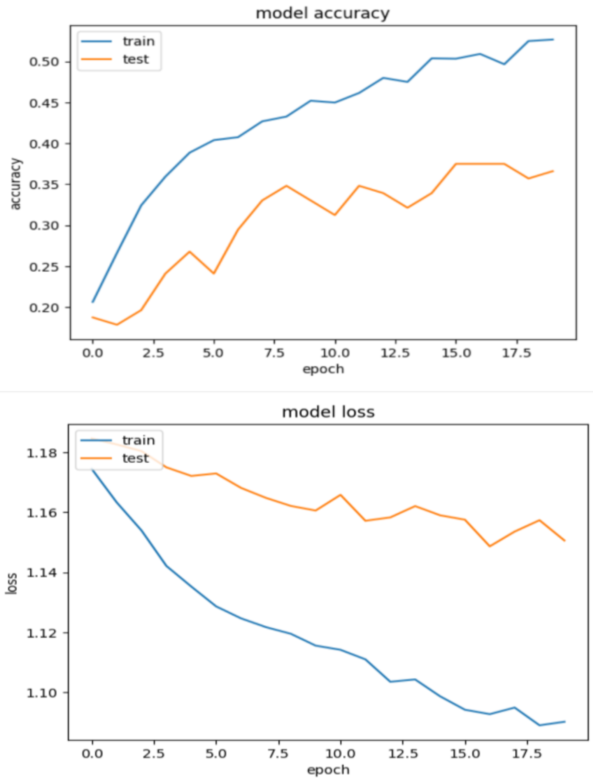


Graph 3.Using the VGG19 architecture the model computed the following accuracy and loss for 50 epochs.

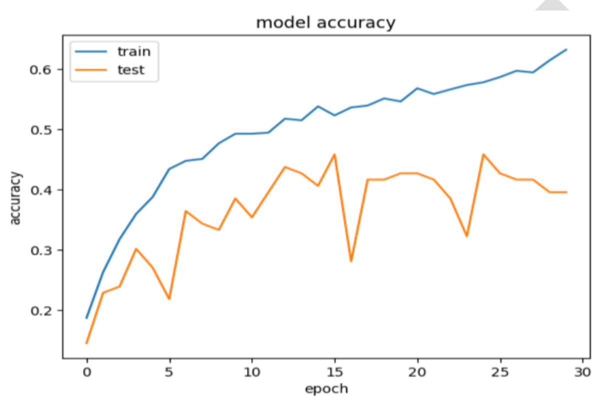


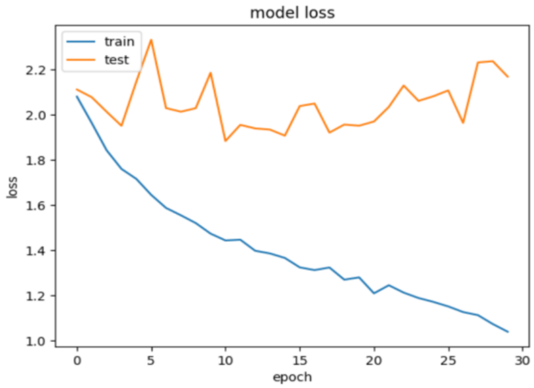


Graph 4.Using the SVM architecture the model computed the following accuracy and loss for 20 epochs.

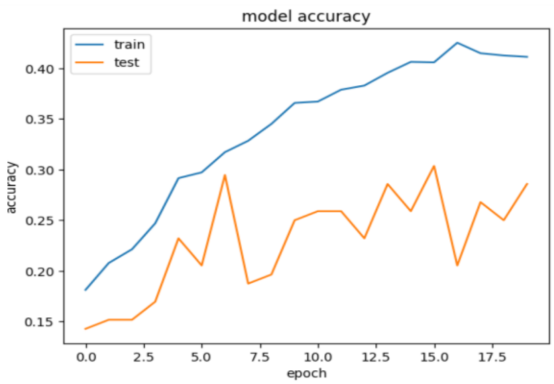


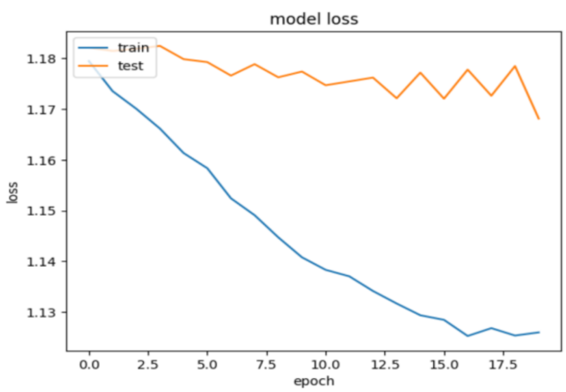
Graph 5.Using the Inception architecture the model computed the following accuracy and loss for 30 epochs.





Graph 6.Using the Xception architecture the model computed the following accuracy and loss for 20 epochs.





V. FUTURE SCOPE

The future scope involves further refinement and exploration of machine learning algorithms, potentially integrating advanced techniques and expanding datasets. Additionally, real-world implementation and integration of these models into clinical settings can enhance their practical utility for accurate and timely diagnoses.

VI. CONCLUSION

In conclusion, the comparative analysis demonstrates the superiority of the neural network algorithm for skin cancer detection. Machine learning, particularly CNNs, holds promise in revolutionizing early diagnosis, aiding doctors in providing timely treatment and preventing disease deterioration. Future advancements and practical implementations are essential for realizing the full potential of these algorithms in clinical applications.

The discussion section is important in this study with more detail to explore the problem of study

VII. REFERENCES

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This literature review study the references should be more than 30 references