IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 8.102 ⁐ Peer-reviewed & Refereed journal ⁐ Vol. 13, Issue 3, March 2024

DOI: 10.17148/IJARCCE.2024.13367

A DEEP LEARNING APPROACH TO DETECT SKIN CANCER USING DERMOSCOPIC IMAGES

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Abstract: Dermatology remains one of the foremost branches of science that is uncertain and complicated because of the sheer number of diseases that affect the skin and the uncertainty surrounding their diagnosis. The variation in these diseases can be seen because of many environmental, geographical, and gene factors and the human skin is considered one of the most uncertain and troublesome terrains particularly due to the presence of hair, its deviations in tone and other similar mitigating factors. Skin disease diagnosis at present includes a series of pathological laboratory tests for the identification of the correct disease and among them, cancers of the skin are some of the worst. Skin cancers can prove to be fatal, particularly if not treated at the initial stage. The idea behind this project is to make it possible for a common man to get a sense of the disease affecting his/her skin so they can get a head start in preparing for its betterment and the doctor in charge can get an idea about the type of cancer which helps them in the diagnosis. Users are greeted with a login page, and when they log into the home page, users can upload an image of the diseased part of their skin. The trained model gives a prediction, following which the users can take the necessary steps to contain the disease.

I. INTRODUCTION

Skin Cancers have wreaked havoc since the early ages, and it is particularly because of the sheer number of cancers that are present that they pose such a high risk. It is difficult to diagnose them without a laboratory test. And there are a growing number of people who deem the diseases of skin too trivial to get diagnosed by a doctor.

In a rare case if the disease indeed is something fatal, without proper treatment, the patient could be in mortal danger. In our attempt to bring about a change in this ecosystem, we have proposed an automatic skin cancer classification system that can help people in identifying the cancer that has spread.

The Convolutional Neural Network system proposed in this paper aims at identifying seven skin cancers: Melanocytic Nevi, Melanoma, Benign keratosis-like lesions, Basal cell carcinoma, Actinic keratoses, Vascular lesions, and Dermatofibroma. We were able to get our hands on the dataset: "Skin Cancer MNSIT: HAM 10000", which contains a disproportionate number of images for each of the seven diseases ranging from a few hundreds to a few thousands.

A user can theoretically get accurate predictions when they upload an image of the deteriorated skin, given the dataset is of a certain quality and the classification result is of acceptable accuracy. We have followed the same principles and have come up with a system that can accurately detect 7 types of skin cancers.

II. LITERATURE REVIEW

SCOPE AND METHODOLOGY

Scope

The scope of this approach is significant, as Skin cancer is one of the most common cancers and early detection is critical for successful treatment. Dermoscopic images provide a wealth of information that can aid in the diagnosis of skin cancer, but interpreting these images requires extensive expertise and can be time-consuming. The use of deep learning-based approaches such as CNN models can help improve the accuracy and speed of skin cancer diagnosis by automating the process of analyzing Dermoscopic images.

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Methodology

Using dermoscopic images, our solution uses a deep learning technology to identify skin cancer. Initially, we gather a large dataset of dermoscopic pictures of benign and malignant skin lesions. To guarantee that both classes are fairly represented, these photos have been carefully sorted. We then preprocess the data to improve model performance and convergence, shrinking the photos and using normalization techniques.

The TensorFlow and Keras packages are then used to build a sequential model. The convolutional layers in this sequential model are used for feature extraction, the pooling layers reduce dimensionality, and the densely connected layers are used for classification. We attain optimal performance by experimenting iteratively and altering the number of layers, filter sizes, and activation functions in the design.

After building the model, we use Adam optimization or stochastic gradient descent to train the sequential model on the prepared dataset. We evaluate the model's performance during training by keeping an eye on important performance indicators like accuracy, precision, recall, and F1 score. We also make use of strategies like learning rate scheduling to improve convergence and early halting to avoid overfitting.

Lastly, we use an independent test set to assess the model's performance and display the results using precision-recall curves, ROC curves, and confusion matrices. This thorough assessment guarantees our deep learning method's generalization capacity and robustness for detecting skin cancer from dermoscopic pictures.

III. DESIGN AND IMPLEMENTATION

System design is a crucial phase following the Software Development Life Cycle (SDLC). It starts with requirement analysis and progresses to designing the overall system structure. The main goal of system design is to outline the architecture, modules, their relationships, purposes, and how they integrate. This phase provides a comprehensive overview of the system flow and architecture.

Architectural Design

Architectural design in software engineering entails the detailed description and visualization of a system's structure, serving as a blueprint for understanding its components, attributes, and interactions. This comprehensive process involves defining the system's building blocks, including modules, layers, and components, along with their externally visible properties and behaviors. Through architectural design, the relationships and dependencies among these components are meticulously delineated, guiding the system's behavior and functionality.

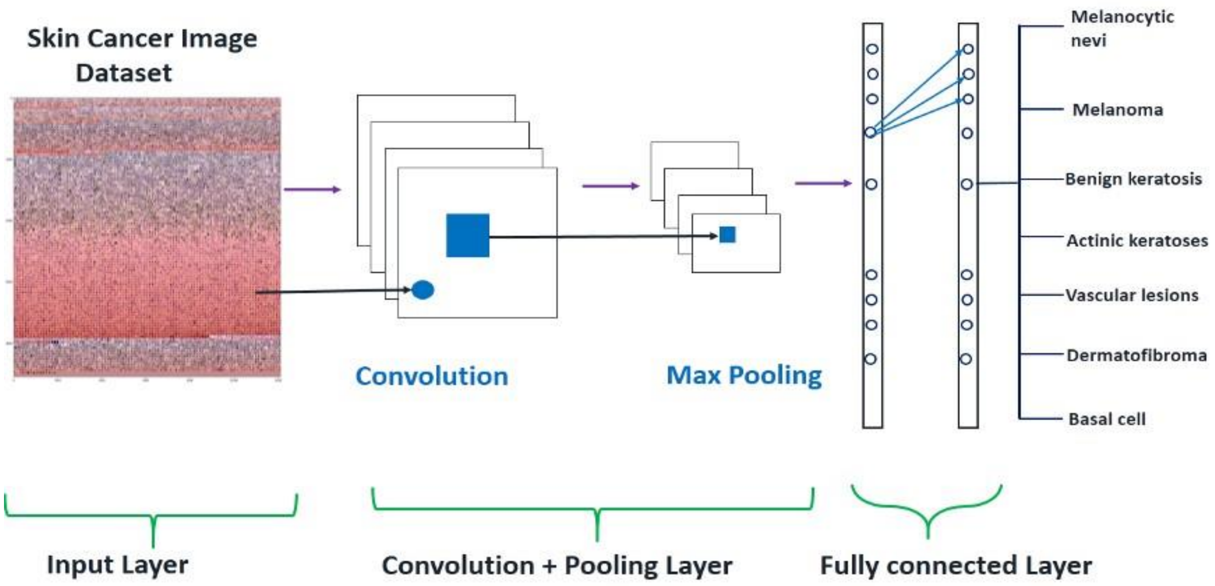

Fig 1. Architecture diagram of Proposed work

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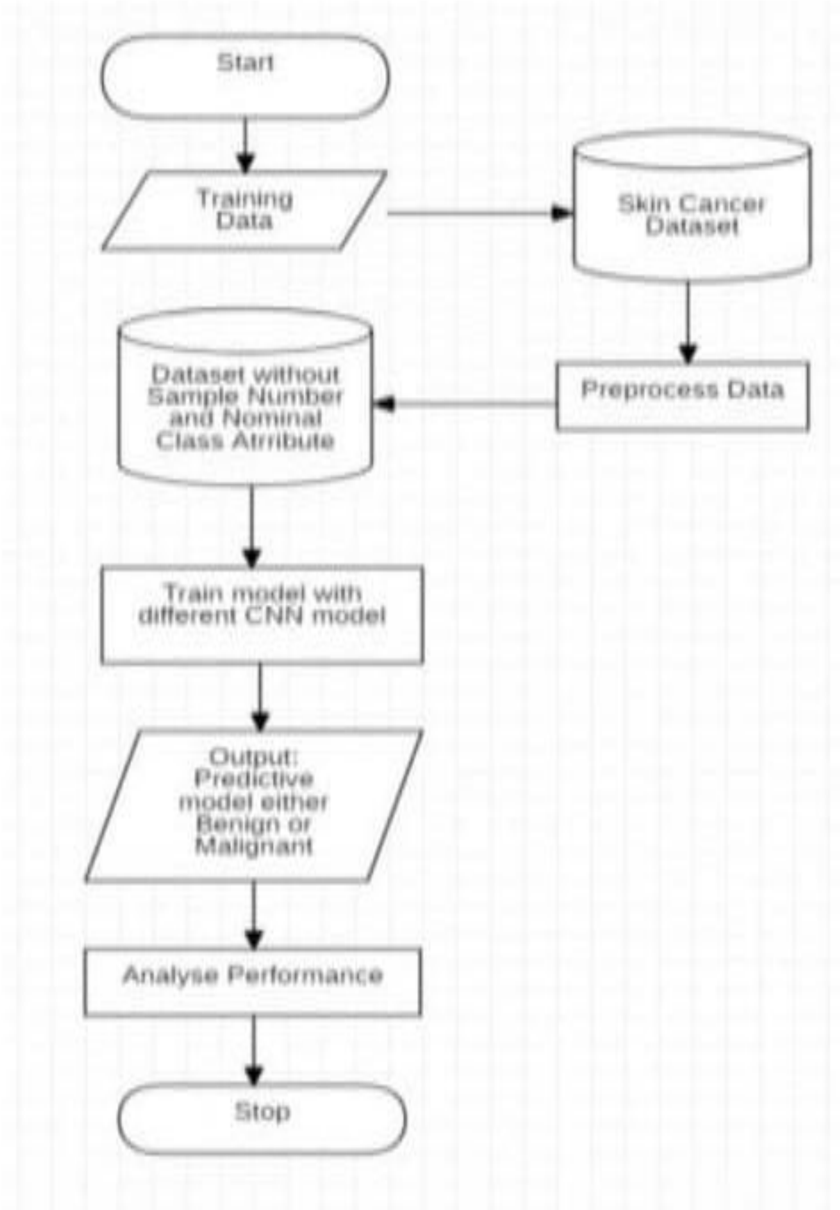

Fig 2. Data Flow Diagram of Proposed System

IV. RESULT AND CONCLUSION

Result

Using dermoscopic pictures, our deep learning method successfully identified skin cancer with an impressive 88% accuracy rate. This precision demonstrates the model's capacity to accurately and precisely categorize skin lesions as benign or cancerous. Additionally, our model performed well on a variety of other evaluation criteria, including F1 score, precision, and recall, demonstrating its utility in reducing false positives and accurately diagnosing malignant lesions.

We created a strong sequential model by carefully selecting the dataset, preparing it, and building the model. We used convolutional layers to extract features and densely linked layers to classify the data. The model's architecture was further improved by hyperparameter tuning and optimization techniques, which improved the model's capacity to identify minute patterns suggestive of malignant lesions.

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With the use of early stopping and learning rate scheduling, our model demonstrated steady convergence during training and reduced overfitting. In order for the model to be practically applicable in real-world circumstances, it was imperative that it ensured good generalization to unknown data.

The thorough analysis of our model's performance, which includes ROC curves and confusion matrices as visualizations, supports its dependability and effectiveness in the identification of skin cancer. Our deep learning method has an 88% accuracy rate, making it a useful tool for dermatologists and other medical professionals to diagnose skin cancer early and reliably. This could lead to better patient outcomes and a decrease in the need for intrusive operations.

Conclusion

In conclusion, our deep learning approach utilizing dermoscopic images for skin cancer detection has demonstrated remarkable effectiveness, achieving an accuracy of 88%. This high accuracy underscores the potential of deep learning models in aiding dermatologists and healthcare professionals in the early and accurate diagnosis of skin cancer, ultimately leading to improved patient outcomes.

Through meticulous dataset collection, preprocessing, and model construction, we developed a robust sequential model that leverages convolutional layers for feature extraction and densely connected layers for classification. The optimization of model architecture and hyperparameters, coupled with rigorous training and evaluation, contributed to the model's strong performance.

The comprehensive evaluation of our model, encompassing various metrics such as precision, recall, and F1 score, along with visualizations including confusion matrices and ROC curves, provides confidence in its reliability and generalization capability. Additionally, techniques such as early stopping and learning rate scheduling were employed to mitigate overfitting and enhance convergence during training.

Moving forward, our deep learning approach holds promise for integration into clinical practice, offering a valuable tool for dermatologists in screening and diagnosing skin cancer. Continued research and refinement of these models, alongside advancements in imaging technology and dataset availability, will further bolster their utility and impact in the field of dermatology and oncology.

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