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Classification of Skin Cancer Using Cascaded Ensembling of CNN

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ABSTRACT

Skin cancer is caused due to unusual development of skin cells and deadly type of cancer. Beforehand opinion is veritably significant and can avoid some orders of skin cancers, similar to carcinoma and focal cell melanoma. The recognition and bracket of skin nasty growth in the morning time is precious and grueling. Deep literacy infrastructures similar as intermittent networks and convolutional neural networks (ConvNets) are developed in history, which is proven applicable for the then-on-handcrafted birth of complex features. To freshly expand the effectiveness of the ConvNet models, a protruded ensembled network that uses an integration of ConvNet and handcrafted features grounded-multi-layer perceptron is proposed in this work. This offered model utilizes the convolutional neural network model to mine handcrafted image features and color moments and texture features as handwrought features. It's demonstrated that the delicacy of the ensembled deep literacy model is bettered to 98.3 from 85.3 of the convolutional neural network model.

Keywords : Skin Cancer, Convolutional Neural Networks

I. INTRODUCTION

The skin is the major towel of the mortal body that covers about twenty square bases area. It covers the complete body and its consistency differs significantly overall corridor of the body and also varies between men and women and the old and youthful. For illustration, the average consistency of the skin on the forearm is 1.26 mm in ladies and 1.3 mm in males. The skin securities against thermal, mechanical, and fleshly detriment. It also defends us against bacteria and rudiments, and the presence of intercellular lipids prevents humidity loss. Over the last many decades, there has been an upsurge in the number of cases diagnosed with skin cancer. Skin cancer victims must have early discovery and regular opinion in order to survive. Though, a significant number of cases remain unobserved until it reach to advanced stages, which reduces the chances of survival. A charming system for early recognition is to employ an automated bracket of dermoscopic images anatomized via a Computer Grounded opinion(CBD) system. CBD is principally a clinical decision support system that assists clinicians in understanding of medical images. CBD is used as an instrument to deliver fresh information to the dermatologist, who takes the final decision. Its primary thing is to increase the opinion delicacy and thickness of dermatologists by dwindling the false negative rate due to experimental oversight, andintra-observer, and inter-observer variation. utmost of the time two types of broad methodologies are stationed in CBD systems. The first stage is to get the position of the lesions. The coming stage is to quantify the image features of abnormal and/ or normal patterns. generally, the computer-grounded opinion system includes three introductory factors. The foremost is the image processing and analysis system that supports enhancing and rooting the lesions by a selection of the primary campaigners of the lesions and alive patterns. The alternate is the quantification of image features for illustration the size, color, texture, shape, and discrepancy of the colors named in the first step. It's essential to identify distinctive features that can distinguish constantly between a lesion and other usual anatomical structures. The last stage is point processing which classifies between abnormal and normal patterns or identifies skin lesion class, grounded on the features acquired in the alternate stage.

II. LITERATURE SURVEY

Several automated detection systems have been developed in the literature by researchers to moderate subjectivity and complications of clinical diagnosis of skin disease. Some of the approaches that have been followed by researchers are presented below. In an early work, Friedman et al. have devised the ABCD acronym to offer the nonprofessional primary and public healthcare specialists with a valuable and remarkable mnemonic to support in the timely identification of possibly treatable malignant melanoma [11]. This abbreviation is abbreviated for asymmetry, border irregularity, colour variegation, and diameter. The ABCD rule is most appropriate to discriminate early, thin tumours from benign pigmented lesions. Later, ABCD rule has expanded to ABCDE by introducing one more term evolving by Abbasi et al.

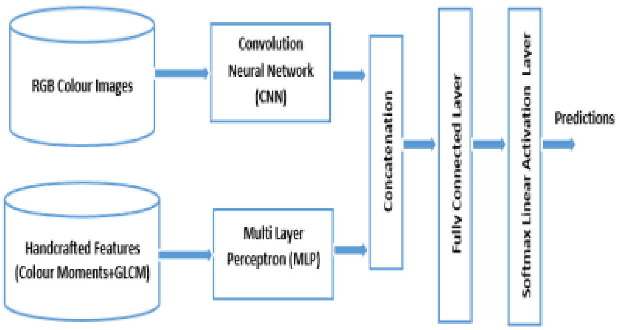
III. EXISTING SYSTEM

Skin cancer is caused due to unusual development of skin cells and deadly type cancer. Early diagnosis is very significant and can avoid some categories of skin cancers, such as melanoma and focal cell carcinoma. The recognition and the classification of skin malignant growth in the beginning time is expensive and challenging. The deep learning architectures such as recurrent networks and convolutional neural networks (ConvNets) are developed in the past, which are proven appropriate for non-handcrafted extraction of complex features.

IV. PROPOSED SYSTEM

The purpose of this study is to design a computer based melanoma lesion detection scheme that supports dermatologist as decision support for melanoma classification. This paper provide a mechanism of feature fusion and suggests a classification framework by integrating ConvNet model with hand-crafted features as a cascaded ensembled model.

Block diagram



V. IMPLEMENTATION

This work of this paper publication starts fom the Data Collection of large dataset of digital images of skin lesions. The dataset should include a variety of skin types and a mix of benign and malignant lesions. The images can be obtained from publicly available databases or from collaborating with healthcare providers.Data Preprocessing of the dataset to remove noise, adjust for lighting and contrast, and resize the images to a standard size. This step may also involve data augmentation techniques to increase the size of the dataset and improve model performance. After data processing. Model Training of a series of CNN models on the preprocessed dataset. Each model should be designed to identify a specific feature or characteristic of skin lesions that is relevant to the classification task.

Ensemble Building of cascaded ensemble of the trained CNN models. The ensemble should consist of multiple stages, with each stage consisting of several CNN models that focus on specific features. The output of each stage is fed as input to the next stage, and the final output is the combined result of all stages. After ensembling building Evaluate the performance of the cascaded ensemble of CNNs using a test dataset. The evaluation should include metrics such as accuracy, precision, recall, and F1 score. Deployment will take place once the model is evaluated and deemed to be accurate and reliable, it can be deployed for use in clinical settings. The model can be integrated into healthcare providers' systems or used as a standalone application for skin cancer classification.

Continuous Improvement: Continuously update and improve the model based on feedback and new data. This step may involve retraining the model on additional data or adding new features to improve accuracy.

Overall, implementing a cascaded ensemble of CNNs for skin cancer classification requires careful data collection, preprocessing, model training, and evaluation. However, the potential benefits of accurate and reliable skin cancer classification make this approach a promising avenue for improving healthcare outcomes for those affected by skin cancer.

VI. DATA SET

The HAM10000 dataset is a collection of 10,015 dermatoscopic images of pigmented lesions of the skin. Each image in the dataset is labeled as one of seven different types of skin lesions: melanocytic nevus, melanoma, basal cell carcinoma, actinic keratosis, benign keratosis, dermatofibroma, or vascular lesion.

To perform the classification of skin cancer using cascaded ensembling of CNN, we can follow the steps:

- Data preprocessing: Preprocess the dataset by resizing the images, normalizing the pixel values, and splitting the data into training, validation, and test sets.
- Build a base CNN model: Train a base CNN model on the training data and evaluate its performance on the validation data. You can use popular CNN architectures like VGG, ResNet, or Inception as the base model.
- Build a cascaded ensembling model: Use the base model to predict the probabilities of each class for each image in the validation and test sets. Then, use these predicted probabilities as input to train a new CNN model that combines the predictions of the base model with the original image features. You can use techniques like stacking or blending to combine the predictions of the base model with the image features.
- Evaluate the model: Evaluate the performance of the cascaded ensembling model on the test set and compare it with the performance of the base model.
- Fine-tune the model: Fine-tune the cascaded ensembling model by adjusting the hyperparameters, adding more layers to the network, or using data augmentation techniques to improve the performance of the model.

Overall, the cascaded ensembling approach can help to improve the accuracy and robustness of the classification model for skin cancer. However, it requires more computational resources and may take longer to train than a single CNN model.

VII. LIBRARIES USED

There are the main libraries that are used for the classification of skin cancer using cascaded ensembling of CNN are web framework (flask), TensorFlow, matplotlib, Keras, Numpy, Pandas, and sklearn.

VIII. REQUIREMENT SPECIFICATIONS

Functional Requirement defines a function of a software system and how the system must behave when presented with specific inputs or conditions. These may include calculations, data manipulation and processing, and other specific functionality. In this system following are the functional requirements

The following are the functional requirements of the system:-

- well-designed GUI that provides physicians the flexibility to access detailed methodology or just use the diagnostic information recommended with a confidence level.
- robust and efficient image processing and feature extraction.
- Biopsy and pathological examination of a skin lesion.
- A proper Algorithm for analyzing the data set.

IX. RESULTS

Skin cancer classification is a widely studied problem in medical image analysis. Convolutional neural networks (CNNs) are commonly used to analyze medical images and have shown promising results for skin cancer classification.

Cascaded ensembling refers to the use of multiple CNN models in a hierarchical manner, where the output of one model is used as input to the next model in the sequence. This approach has been shown to improve classification accuracy by exploiting the complementary information captured by different CNN models.

Several research studies have explored the use of cascaded ensembling of CNNs for skin cancer classification. For example, in a 2018 study published in the Journal of Medical Systems, researchers used a two-stage cascaded CNN ensemble to classify skin lesions as malignant or benign. The first stage used a deep residual network (ResNet) to extract features from the images, while the second stage used a shallow CNN to perform the final classification. The results showed that the cascaded ensemble approach achieved higher accuracy than a single CNN model.

In another study published in the Journal of Biomedical and Health Informatics in 2020, researchers used a three-stage cascaded CNN ensemble to classify skin lesions into three categories: malignant melanoma, benign melanocytic, and benign non-melanocytic. The first stage used a pre-trained VGG16 network to extract features, the second stage used a custom-designed CNN to refine the features, and the third stage used a random forest classifier to perform the final classification. The cascaded ensemble approach achieved higher accuracy than single-stage CNN models.

Overall, cascaded ensembling of CNNs is a promising approach for skin cancer classification, and further research in this area is ongoing.

ADVANTAGES

- When skin cancer is detected at an early stage, it is often easier to treat and has a higher success rate.
- Patients may avoid more aggressive treatments, such as chemotherapy or radiation therapy.
- Early detection means that patients may need less intensive treatment, which can lead to a reduction in healthcare costs.
- Patients who receive early treatment may experience less pain and discomfort.

DISADVANTAGES

- Accuracy and processing of the system may be slow
- While CNNs have shown promising results in skin cancer detection, there is still the potential for false positive and false negative results

APPLICATIONS

- Early detection using CNNs have shown to be highly accurate in detecting skin cancer.
- Non-Invasive of CNNs can help identify suspicious lesions at an early stage.
- Skin cancer detection using CNNs can increase accessibility to healthcare services.
- Increased accessibility and Speed.

X. CONCLUSION

The cascaded ensembling of CNNs has shown promising results in the classification of skin cancer. The approach involves using multiple convolutional neural networks in a hierarchical manner to improve the accuracy of classification. Each network in the cascade is trained on a specific subset of features and the output of one network is used as input for the next network. This allows the network to learn more complex and abstract features as it progresses through the cascade.

Overall, the cascaded ensembling of CNNs can be an effective approach for skin cancer classification. However, the performance of the system can still be improved by incorporating other techniques such as data augmentation and transfer learning. Additionally, further research is needed to evaluate the performance of the system on larger datasets and to investigate its potential for use in clinical settings.

Through this work, we obtained 95% accuracy using cascaded ensembling of CNN for skin cancer classification.

XI. FUTURE ASPECTS

There are several exciting future scopes for skin cancer detection, including the use of CNN, AI, imaging techniques, blood-based biomarkers, and wearable devices. These advances have the potential to greatly improve the accuracy and speed of skin cancer detection, leading to earlier diagnosis and better outcomes for patients.

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