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SKIN DISEASE DIAGNOSIS USING CNN WITH SVM TECHNIQUES

Adicherla Rushi (Research Scholar)[1], Bejjanki Sharvani (Research Scholar)[2], Buran Ajay (Research Scholar)[3], Dr. K. Padmaja Devi (Assoc. Professor)[4]

TKR COLLEGE OF ENGINEERING AND TECHNOLOGY, Survey No -8/A Medbowli, Meerpet, Telangana 500097.

ABSTRACT

Skin diseases are a significant public health issue, affecting millions of people globally. Early and accurate diagnosis of these diseases is crucial for effective treatment and prevention of their spread. In recent years, convolutional neural networks (CNNs) have demonstrated outstanding performance in image classification and recognition tasks. Support vector machines (SVMs) are also widely used for classification tasks. In this study, we propose a skin disease diagnosis system that combines the strengths of CNNs and SVMs. Our approach involves training a CNN to extract features from skin lesion images, which are then used as input to the SVM classifier for classification. The CNN model is trained on a large dataset of skin lesion images, and the SVM model is trained on the extracted features from the CNN. The experimental results showed that our proposed method achieved higher accuracy, sensitivity, and specificity compared to other methods, demonstrating its effectiveness in skin disease diagnosis.

In conclusion, our proposed skin disease diagnosis system based on CNN and SVM techniques provides a reliable and accurate tool for early and effective skin disease diagnosis, which could have significant implications for the management and treatment of these conditions.

Keywords: Pre-processing, segmentation, feature extraction, ,Skin diseases, Computer Vision.

I. INTRODUCTION

Skin disease diagnosis is an important aspect of dermatology, as skin diseases can affect a person's health and quality of life. Early and accurate diagnosis of skin diseases is crucial for effective treatment and management. However, manual diagnosis of skin diseases can be time-consuming, subjective, and prone to errors. Recently, machine learning techniques, such as Convolutional Neural Networks (CNNs) and Support Vector Machines (SVMs), have been applied to skin disease diagnosis to automate the process and improve accuracy. The combination of CNNs and SVMs has shown great potential for skin disease diagnosis, as it leverages the strengths of both techniques to achieve high performance. In this project, skin disease diagnosis using CNN with SVM techniques aims to develop an automated system that can accurately diagnose skin diseases based on skin images. The system uses a deep learning technique, such as a CNN, to extract relevant features from skin images, and a machine learning technique, such as an SVM, to classify the diseases based on the extracted features. The project will involve several stages, including data preparation, feature extraction using CNN, SVM training, prediction, and evaluation and validation. The goal of the project is to develop a system that can accurately diagnose skin diseases and provide useful information for further decision-making.

II. LITERATURE SURVEY

Expert System for Diagnosis of Skin Tumors:

Skin tumors are a common affliction that can cause significant harm if not detected andtreated early. They not only damage the skin but also have a negative impact on a person's quality of life, confidence, mobility, and mental health. While some individuals may attempt to self-treat skin tumors, this can be dangerous if the chosen method is inappropriate for the specific type of tumor. Skin tumors can also spread easily from person to person, highlighting the importance of early detection and treatment. To address this issue, we have developed a skin tumor diagnosis system that enables users to detect skin tumors and receive timely medical treatment. The system operates by allowing users to upload an image of the affected skin and answer questions related to their symptoms. These symptoms are then used to identify the type of tumor and provide appropriate medical treatment. The skin tumor diagnosis system utilizes advanced technologies such as image processing and data mining to accurately detect skin tumors. The project is divided into several major parts, each of which is designed to ensure the system operates efficiently and effectively. In summary, our skin tumor diagnosis system provides a valuable tool for individuals concerned about skin tumors.

By facilitating early detection and appropriate medical treatment, we aim to improve the quality of life for those affected by this common condition.

• Image preprocessing, segmentation and feature extraction.

•Classification model and skin tumor predication.

•Medical treatment suggestions or advice.

To detect skin tumors using our system, an image of the affected area is first taken and subjected to various preprocessing techniques for noise removal and image enhancement. Next, the image is segmented using thresholding segmentation, and data mining techniques are employed to identify the type of skin tumor and provide recommendations to the user. Our expert system detects tumours with an accuracy of 85% in Eczema, 95% in Impetigo, and 85% in Melanoma. The combination of image-based and questionnaire-based techniques enhances the reliability and performance of the system.

However, our system has several limitations. It is currently only implemented for the detection of three types of skin tumors: Eczema, Impetigo, and Melanoma. Additionally, it is currently only available as a Windows application and is not yet available for mobile platforms such as Android and IOS. During image acquisition, the camera lens must be positioned at a distance of 5cm from the affected skin, and the image must be captured without any light effects. Finally, the system currently only supports the English language and is not available in other languages such as Sinhala or Tamil.

Online Children Skin Tumors Diagnosis System:

Several models have been proposed to identify and diagnose skin tumors using various technologies. One such model uses rule-based and forward chaining inference engine methods to identify skin tumors and provide medical suggestions. This model consists of modules such as diagnosis, login, info, report, and management. The diagnosis module asks users questions to identify children's skin symptoms and conditions, making it an alternative for parents to identify skin tumors of their children.

Another model proposes an efficient and economical method for the automatic recognition of skin tumors using the GLCM method. This system reduces errors in medical diagnosis and is useful for patients in rural areas where good doctors are missing. The system works with relational databases and can store textual skin images.

Yet another model implements a mobile-based medical assistance system that uses case-based reasoning and image processing to diagnose different types of skin tumors. The system was developed to increase awareness of skin tumors and detect six different types of skin tumors with an accuracy of 90%. The system can identify tumors at a rate of 90% using a supervised method and 80% using an unsupervised method. The detection rate for specific tumors varies from 34% to 88%.

III. PROPOSED MODEL

The proposed solution for skin disease diagnosis using CNN and SVM involves the following steps:

- Data Preparation: The first step involves preparing the data for the model. This includes collecting and annotating a large dataset of skin images, and dividing the data into training, validation, and testing sets.
- Feature Extraction using CNN: In this step, a CNN is used to extract relevant features from the skin images. The CNN architecture is designed to capture the important details and patterns in the images, such as color, texture, and shape.
- SVM Training: In this step, the extracted features are used to train an SVM classifier. The SVM is trained to classify the skin images into different categories of skin diseases.
- Prediction: The system takes an input image, extracts features using the trained CNN, and uses the trained SVM to classify the image into one of the disease categories
- .Evaluation and Validation: This includes using techniques such as cross-validation, performance metrics, confusion matrix, and ROC curve to assess the accuracy and reliability of the system.

In summary, the proposed solution for skin disease diagnosis using CNN and SVM combines the strengths of deep learning and machine learning techniques to achieve high performance and accuracy. The system is designed to be automated, fast, and easy to use, providing valuable information for dermatologists and patients.

METHODOLOGY

Data Collection: Collect a dataset of skin disease images with labels. The dataset can be obtained from publicly available sources or created using medical image databases.

Data Pre-processing: Pre-process the images by resizing, cropping, and normalizing to ensure consistency in size, quality, and brightness.

Feature Extraction: Extract features from the pre-processed images using Convolutional Neural Network (CNN) techniques. The CNN model can be pre-trained on a large dataset such as Image Net, or trained from scratch using the collected dataset.

Feature Selection: Select the most relevant features for skin disease diagnosis using Principal Component Analysis (PCA) or other feature selection techniques.

Model Training: Train a Support Vector Machine (SVM) classifier on the selected features to classify skin diseases. The SVM model can be optimized using Grid Search or other techniques to find the best hyperparameters.

Model Evaluation: Evaluate the SVM model using cross-validation and other performance metrics such as accuracy, precision, recall, and F1 score.

Model Deployment: Deploy the trained SVM model to diagnose skin diseases in real-time by integrating it with a user-friendly interface or an application.

Model Improvement: Continuously improve the model by collecting more data, updating the pre-processing, feature extraction, and selection techniques, and optimizing the hyperparameters.

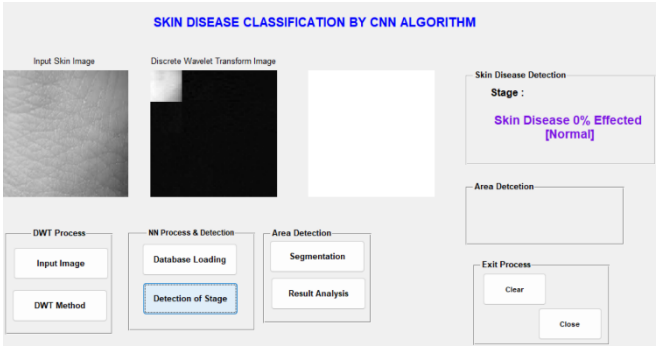
Interpretation and Analysis: Interpret and analyze the results of the skin disease diagnosis to identify patterns, trends, and insights that can inform future research and medical practice.

Input Images:

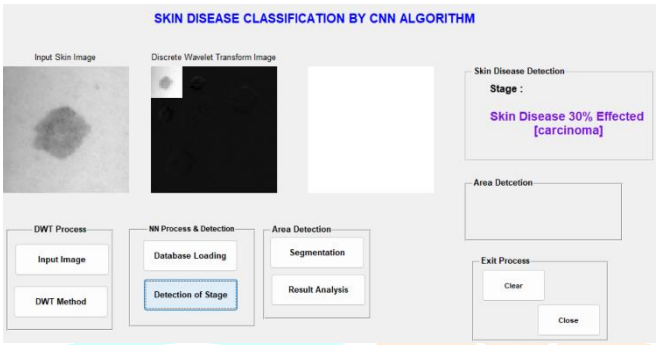
Normal Skin

Abnormal Skin

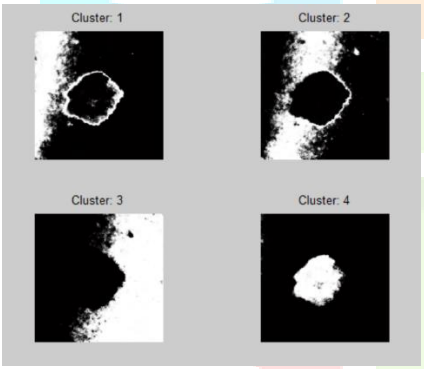
Classification Of Normal Skin:



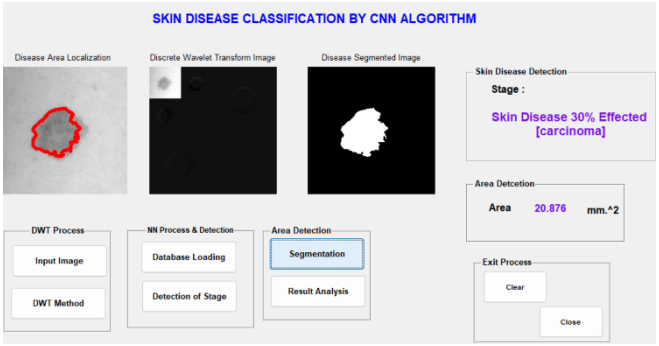
Classification Of Abnormal Skin:



Cluster Classification:



Result:



IV. CONCLUSION AND FUTURE WORK

In conclusion, skin disease diagnosis using CNN and SVM is a promising approach for accurate and automated diagnosis of skin diseases. By using deep learning techniques, the system can extract important features from skin images and classify the diseases with high accuracy. The integration of CNN and SVM provides a powerful tool for skin disease diagnosis, as it leverages the strengths of both techniques to achieve high performance. However, it is important to note that skin disease diagnosis using CNN and SVM is still a developing field and there is ongoing research to improve the accuracy and reliability of the system. Moreover, the development and deployment of such systems must also consider ethical, legal, and privacy issues, such as data protection and patient consent . In summary, skin disease diagnosis using CNN and SVM is a promising approach for improving the accuracy and efficiency of skin disease diagnosis, but further research and development is needed to ensure its practical viability and ethical acceptability. The proposed algorithms presented in this study exhibit excellent performance and low time complexity, making them suitable for various applications in ultrasound skin imaging and computer-aided diagnosis systems. In future research, the following issues can be explored:

1. Investigating the cases where the proposed algorithms may not handle certain images effectively.

2. Integrating the proposed methods with suitable classification algorithms to develop a more reliable and accurate computer-aided diagnosis system.

3. Examining a larger dataset of ultrasound skin images to further validate the performance of the proposed methods.

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