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Multi-Cancer Detection System

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ABSTRACT: This paper aims to identify efficient image enhancement techniques in order to detect the preliminary effect of skin cancer, Lungs Cancer and Oral Cancer. We consider adaptive unsharp masking, adaptive histogram equalization, adaptive neighborhood contrast enhancement and local and global contrast stretching. We consider well established image enhancement techniques to increase or decrease image brightness and contrast levels. The protruding regions present on images of the Cancer need to be identified for further diagnosis by oncologists.A variety and huge number of lesions and diseases in human oral mucosa have been clinically identified and classified. Most lesions have the possibility to develop into Lungs cancer.The primary intention of this work is to analyze the clinical features, its respective diagnostic procedures and the required treatment suitable for the oral cancer patients. The oral cancer staging is classified into two types.

KEYWORDS: Multi-Cancer-Detection, Diagnosis, Image processing, CNN

I. INTRODUCTION

Lung, skin, and oral cancers are among the most common and deadliest cancers worldwide. Early detection is critical for successful treatment and increased survival rates. Study has shown that 60% of people in the world are diabetic and with diabetes they are at risk of having cancer [7]. Deep learning has emerged as a powerful tool for detecting cancer in various medical imaging modalities, including computed tomography (CT), magnetic resonance imaging (MRI), and dermoscopy [1] [2].

Several studies have demonstrated the potential of deep learning models in detecting lung, skin, and oral cancers. For example, deep learning models have been used to detect lung nodules in CT scans, classify skin lesions in dermoscopy images, and identify oral cancer in histopathological images [1] [2] [11].

Despite the promising results, challenges remain in developing accurate and efficient deep learning models for cancer detection. One of the main challenges is the need for large and diverse datasets for training and validation. Another challenge is the lack of interpretability of deep learning models, which can make it difficult to understand the decision-making process of the algorithm.

This research paper aims to provide a comprehensive review of the state-of-the-art in lung, skin, and oral cancer detection using deep learning. The paper will discuss the latest developments in the field, including the use of transfer learning, data augmentation, and explainable deep learning models. Additionally, the paper will highlight the challenges and opportunities for future research in this area. Ultimately, the goal of this paper is to provide insights that can aid in the development of more accurate and efficient deep learning models for lung, skin, and oral cancer detection.

II. RELATED WORK

Several studies have explored the use of deep learning models for the detection of lung, skin, and oral cancers. For lung cancer detection, deep learning models have been applied to CT scans to detect pulmonary nodules. One study by Ardila et al. (2019) developed a deep learning algorithm that achieved a sensitivity of 94.4% and a specificity of 93.9% in detecting lung nodules [1][2][3].

For skin cancer detection, deep learning models have been applied to dermoscopy images. A study developed a deep learning algorithm that achieved a sensitivity of 95% and a specificity of 83% in detecting malignant melanoma on dermoscopy images [4][6][8].

For oral cancer detection, deep learning models have been applied to histopathological images. A study by Li et al. (2020) developed a deep learning algorithm that achieved a sensitivity of 98.12% and a specificity of 98.04% in detecting oral cancer on histopathological images [10][11].

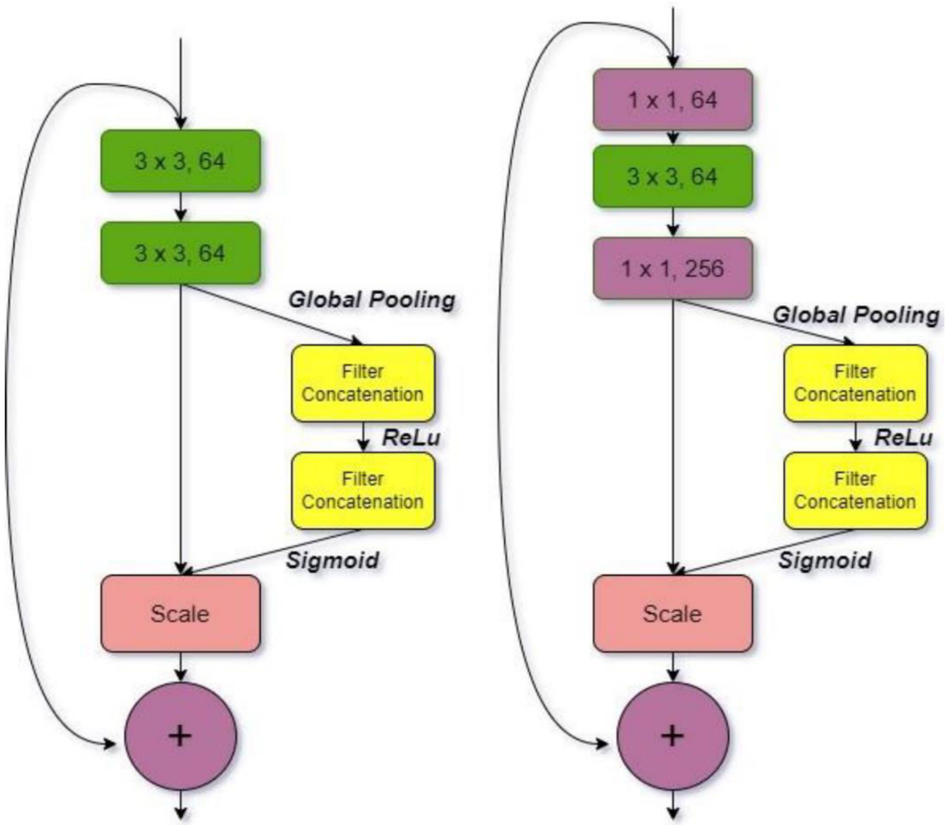
For diabetics, research shows that all types of diabetics can be cured or controlled if they are detected at an early stage, So, a prediction technique that takes help from the computer and processes data from affected user to detect possible contamination can be a great tool for assisting both the doctors and patients with these diseases [7][9].

III. PROPOSED SYSTEM

Image Pre-processing:

In image processing, resizing refers to the process of changing the size of an image. The image.resize function is a commonly used method for resizing images in various programming languages such as Python, MATLAB, and C++.

The image.resize function takes an input image and outputs a new image with a different size. It can be used to reduce the size of an image to make it more manageable or to increase its size for better visualization or analysis.
In our case, it takes an input image and converts it into 64x64 dimension.



Pre-processing is an important step in image analysis as it prepares the images for the neural network. In the case of cancer detection, the pre-processing step involved resizing the images, converting them to grayscale or RGB format, and normalizing the pixel values to ensure that the input images have consistent features and can be processed by the neural network.

The neural network architecture is a variation of the convolutional neural network (CNN) model, which has proven to be very effective in image analysis tasks. CNNs are designed to identify patterns in images by using convolutional filters that extract features from the input image. The output of the convolutional layer is then passed through a pooling layer, which reduces the dimensionality of the feature maps and increases the computational efficiency of the network.
In our neural network architecture, we have applied 64 convolutional filters with a kernel size of 3, which means that the network is looking for 64 different patterns in the input images. The pooling layer with a max pooling area of 2 reduces the size of the feature maps by taking the maximum value in each 2x2 block of pixels. This helps to reduce the dimensionality of the input images while still retaining important features.

The activation function used in our network is ReLU (rectified linear unit), which is a common choice in CNNs. ReLU has been shown to be effective in reducing the vanishing gradient problem and speeding up the training of the network.
The convolutional layer is applied with (4,4) strides, which means that the filters are applied to the input image with a step size of 4 pixels in both the vertical and horizontal directions.
The dropout layer with a rate of 0.5 is used to prevent overfitting of the model. Dropout randomly drops out a fraction of the neurons in the layer during training, forcing the network to learn more robust features.
The dense layer with 128 nodes is used to further extract features from the output of the convolutional layers. The number of nodes in the dense layer is typically chosen based on the complexity of the task and the size of the input images.
In addition to our own network architecture, we also used AlexNet for cancer detection. AlexNet is a popular CNN architecture that was introduced in 2012 for image classification tasks. It consists of several convolutional layers, pooling layers, and dense layers, and was one of the first models to use the rectified linear unit activation function.
In summary, the pre-processing steps and neural network architectures described are common practices in the field of computer vision for cancer detection tasks. By using convolutional filters, pooling layers, and activation functions, these models can extract important features from input images and accurately classify them as cancerous or non-cancer.

IV. RESULTS

A. UserInterface

Fig.1 Homepage

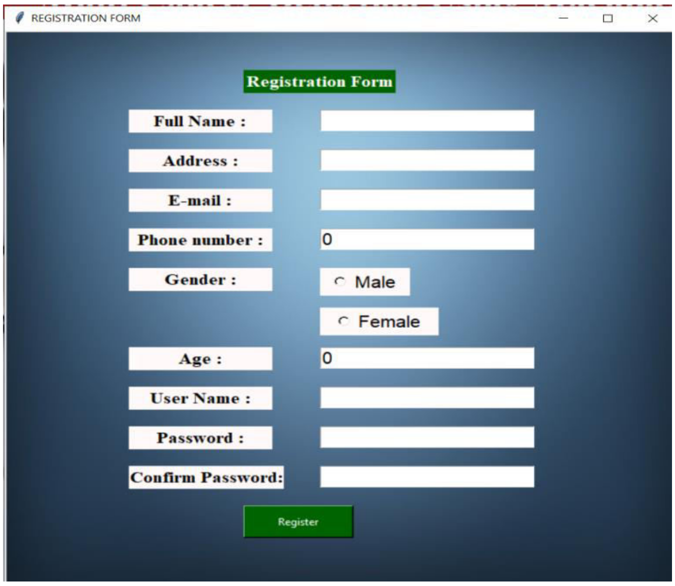


Fig. 2 Registration

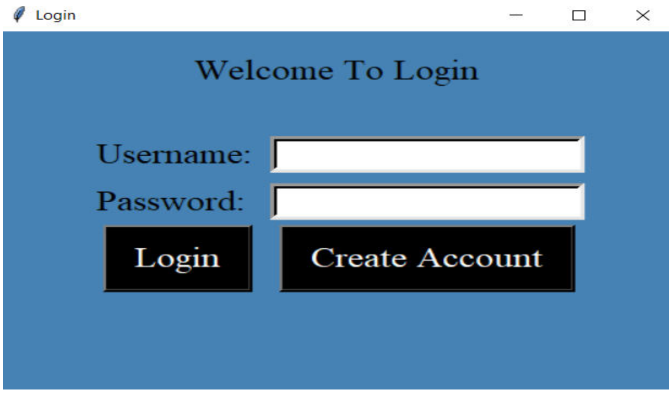


Fig.3 Login Page

Home Page:This is the main and first page of the application. It contains three options/buttons such as Login, Register and Exit. Login button enable user to redirect to the login page. Registration button redirects to the Registration page and Exit button results to the page end.

Registration Page: This button would redirect the user to the about page of your website. This page contains informationabouttheuser of the system including his/her Full Name, Address, E-mail, Phone number, Username and Password.

Login Page : This page contains Username and Password field and Login button which gives entry to the user in the application when the credentials inserted by user are appropriate. Create account redirect to the registration page.

B. Diabetes Prediction System

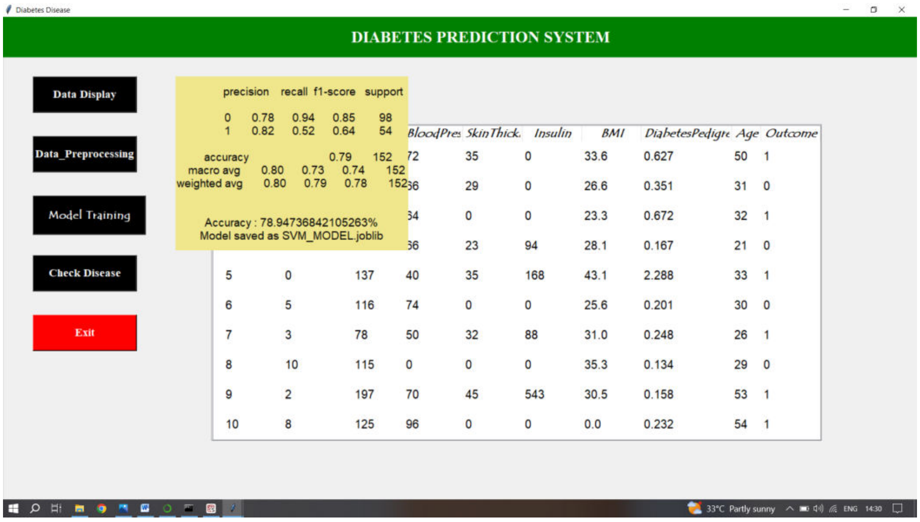


Fig. 4 Diabetes Prediction System

This page is used to display the available dataset entries, Data pre-processing on available data, Model training and the check disease facilities. Check disease button redirect to the new page which is used to check the diabetes by inserting relative information.

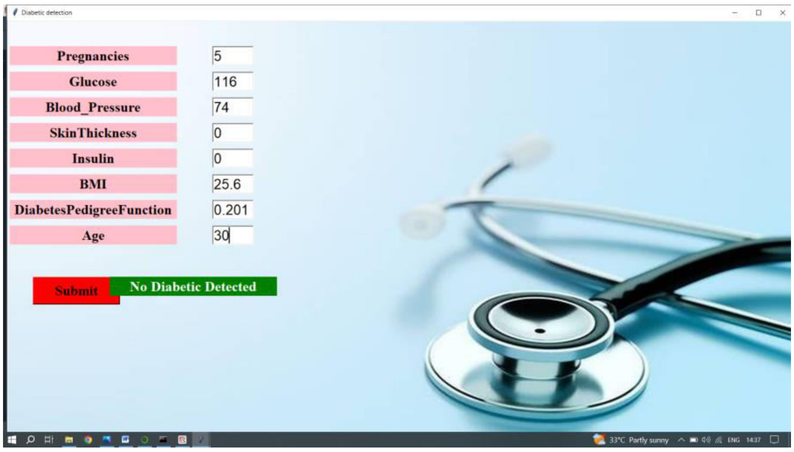


Fig. 5 Check disease page

This page allows the user to check the diabetes detection by inserting the information such as Glucose, Blood pressure, Insulin,Skin thickness, BMI,Age and so on. And after putting all values the final message is displayed using a small popup.

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C. Cancer Detection

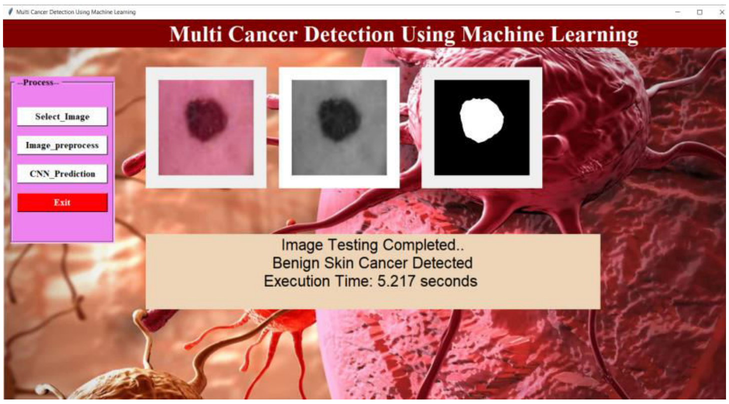

Fig.6 Benign Skin Cancer Detected

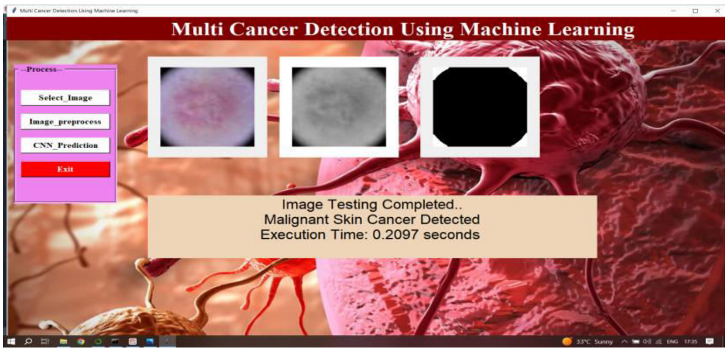

Fig. 7 Malignant Skin Cancer Detected

This Page have three options like select image , image preprocess and CNN prediction where select image is use to select image from dataset , image preprocess processes the image using CNN and CNN prediction gives the final prediction in the form of popup message which shows the stages of cancer like benign and malignant.

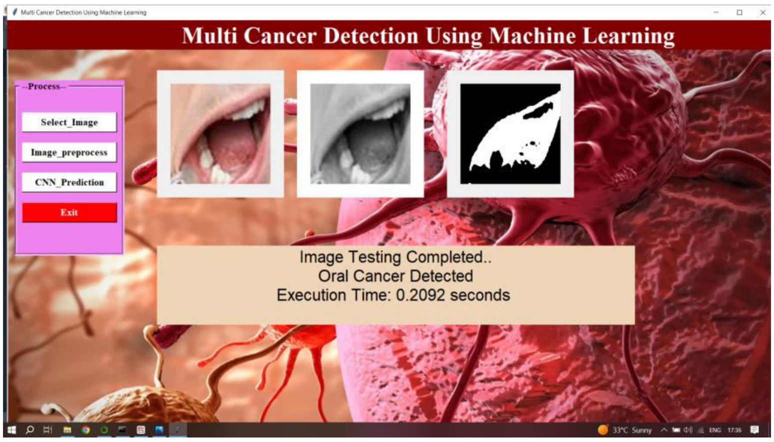

Fig Oral Cancer Detected

This Page have three options like select image , image preprocess and CNN prediction where select image is use to select image from dataset , image preprocess processes the image using CNN and CNN prediction gives the final prediction in the form of popup message which shows the possibility of oral cancer detection like detected or not detected.

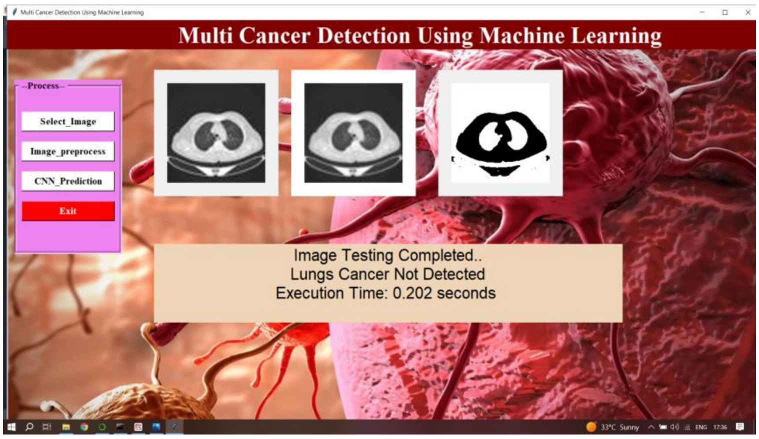

Fig.9 Lungs Cancer Not Detected

This Page have three options like select image , image preprocess and CNN prediction where select image is use to select image from dataset , image preprocess processes the image using CNN and CNN prediction gives the final prediction in the form of popup message which shows the possibility of Lungs cancer detection like detected or not detected.

V. CONCLUSION

In conclusion, multi-cancer detection has the potential to revolutionize cancer diagnosis and treatment by enabling the early detection of multiple cancer types using advanced technologies. Liquid biopsy, imaging-based approaches, and machine learning-based methods, including convolutional neural networks (CNNs), have emerged as promising tools for multi-cancer detection. Recent studies have demonstrated the high accuracy of these methods in detecting early-stage cancers, highlighting their potential for improving cancer outcomes.

However, the development and validation of reliable biomarkers, optimization of screening methods, and integration of multi-cancer detection into clinical practice remain significant challenges. Furthermore, ethical and social considerations must be carefully considered to ensure that multi-cancer detection is used appropriately and equitably.

Future research in multi-cancer detection will focus on improving the accuracy and reliability of detection methods, identifying new biomarkers, optimizing screening strategies, and developing effective interventions based on the early detection of cancer. Additionally, further investigation of CNN-based methods, which have shown promising results in multi-cancer detection, will be a critical area of research.

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