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Diabetic Retinopathy Detection

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ABSTRACT

The most frequent cause of blindness before the age of 50 is diabetic retinopathy, a disorder of the eyes brought on by long-term diabetes. As early signs of DR, microaneurysms caused by leaking from retinal blood vessels have generated a significant body of research on automatic MA identification. The small size of MA lesions, the lack of contrast between the lesion and its retinal background, the wide variations in colour, brightness, and contrast of fundus images, and the high prevalence of false positives in areas with similar intensity values, such as blood vessels, noises, and non-homogenous background, make automated detection of diabetes challenging.. In this system, we analyzed diabetes detectability from retinal images in the Diabetic Retinopathy Database - Calibration Level Raw pixel intensities of extracted patches served directly as inputs into the following classifiers: CNN.

Keywords: Microaneurysms , Diabetic Retinopathy , CNN , SVM , AI , OCT , Angiography.

I. Introduction

Accurate diagnosis has attained in medical procedure by identifying the symptoms using emerging imaging modalities. There are different diagnostic modalities including fluorescein angiography and optical coherence tomography. Fundus Photography is mostly used for the evaluation of diabetic patient eye diseases. The present modalities of medical imaging are invasive and painful for patients as well. Infrared thermography is emerging non-ionizing technique which is non-invasive method and is successfully accepted for diagnosis. Thermal imaging modality recently used in breast cancer detection, diabetic foot and various eye diseases such as dry eye, glaucoma, Meibomian gland dysfunction and thyroid eye diseases. Diabetic eye disease is a chronic disease affects various organs of human body including the eyeAccurate diagnosis has attained in medical procedure by identifying the symptoms using emerging imaging modalities. The present modalities of medical imaging are invasive and painful for patients as well. Diabetic eye disease is a chronic disease affects various organs of human body including the eye. Diabetic retinopathy (DR) is one of the most threatening complications of diabetes in which damage occurs to the retina and causes blindness. It damages the blood vessels within the retinal tissue, causing them to leak fluid and distort vision. Along with diseases leading to blindness, such as cataracts and glaucoma, DR is one of the most frequent ailments, according to the US, UK, and Singapore statistics.

II. Related Work

According to this study, the most common cause of blindness in people of working age is diabetic retinopathy. The first symptoms of DR are microaneurysms, which are caused by leakage from retinal blood vessels. However, due to the tiny size of MA lesions and the lack of contrast between the lesion and its retinal background, automated MA detection is challenging. Deep learning techniques have recently been employed, particularly for image analysis, for automatic feature extraction and classification issues.. In order to detect MA in fundus images, a Stacked Sparse Autoencoder, an example of a DL technique, is proposed in this study. The initial fundus photos are used to create tiny image patches. To find distinctive properties of MA, the SSAE learns high-level features just from pixel intensities. Each image patch is classified as MA or non-MA using the high-level features learned by SSAE. The training/testing data and ground truth are provided via the open benchmark DIARETDB. The 89 photos are divided into 2182 image patches with MA lesions, which serve as positive data, and 6230 image patches without MA lesions, which are produced using a randomly selected sliding window operation, which serve as negative data. SSAE learned directly from the raw image patches and automatically retrieved the distinctive features to categorise the patches using Softmax Classifier without the need for blood vessel removal or laborious preprocessing procedures. Using 10-fold cross-validation, the fine-tuning operation resulted in an improved F-measure of 91.3 and an average area under the ROC curve (AFC) of 96.2.

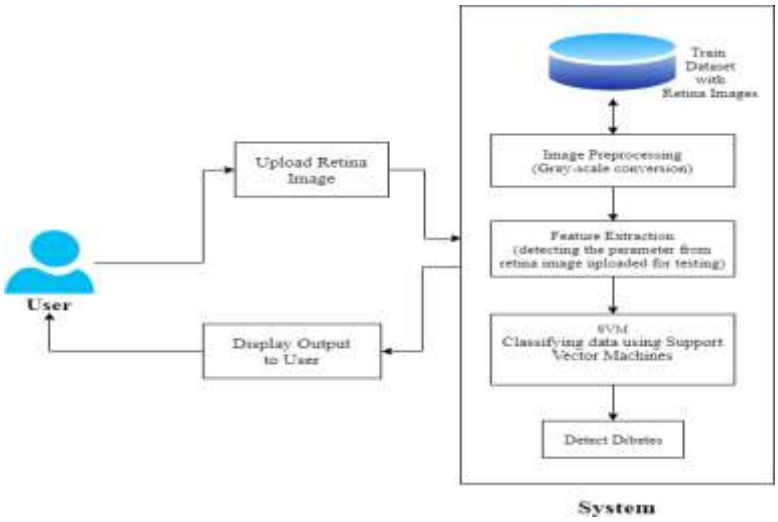
III. Methodology

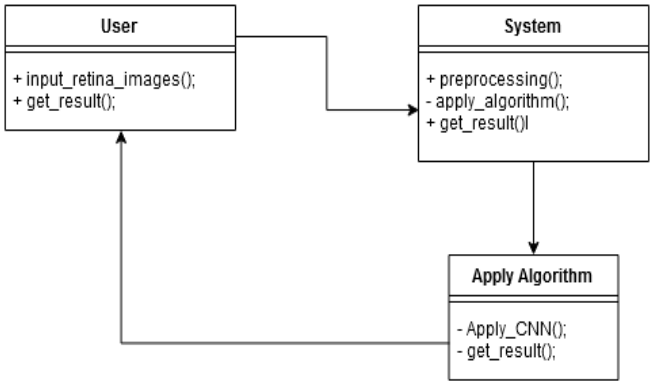
To detect diabetic retinopathy using a CNN algorithm in Python, the following methodology can be followed.

1. Dataset Preparation: Collect a dataset of retinal images labeled with diabetic retinopathy severity levels. Divide the dataset into training and testing sets.

2. Data Preprocessing: Perform image preprocessing techniques such as resizing, normalization, and augmentation to enhance the quality and variety of the dataset.
3. Model Architecture: Design a CNN architecture suitable for diabetic retinopathy detection. This typically involves a combination of convolutional, pooling, and fully connected layers. Experiment with different architectures to achieve optimal performance.
4. Model Training: Initialize the CNN model with appropriate hyperparameters and train it using the training dataset. Use a suitable optimization algorithm such as stochastic gradient descent (SGD) or Adam, and a loss function such as categorical cross-entropy.
5. Model Evaluation: Evaluate the trained model using the testing dataset. Calculate performance metrics such as accuracy, precision, recall, and F1-score to assess the model's effectiveness in detecting diabetic retinopathy.
6. Fine-tuning: Fine-tune the model by adjusting hyperparameters or modifying the architecture based on the evaluation results. Iterate this process until satisfactory performance is achieved.
7. Deployment: Deploy the trained model to predict the presence and severity of diabetic retinopathy in unseen retinal images. Implement a user-friendly interface that accepts input images, processes them using the trained model, and presents the predicted results.
8. Performance Optimization: If necessary, optimize the model for efficiency and performance. This may involve techniques such as model compression, quantization, or deployment on specialized hardware to improve inference speed and reduce resource consumption.

Throughout the entire methodology, it is crucial to maintain a strong adherence to data privacy and ethical considerations, ensuring that the dataset used for training and evaluation is obtained and handled responsibly, with appropriate consent and anonymization procedures in place.





Diabetic Retinopathy Detection(Proposed Work)

In our proposed Work we have-

1. We have introduced a non-invasive procedure developed over previous method from the Base paper which make use of Blood vessel Extraction method.
2. Our method evaluates presence of DR in the eye's and the method used in base paper detects Hemorrhages detection.
3. Classification carried out using SVM classifier over the method of base paper that classifies cases using advanced nonparametric method .

4. In our work we do calibration and justify process using various combinations of texture and statistical features.

The classification of diabetic diseased and normal eye IR images is done through Support Vector Machine classifier using var- ious combination of texture and statistical features The simulation results indicate that the classifier in the detection of diabetic diseased eye performed in the accepted level and provide accuracy, sensitivity, specificity using *SVM* classifier.

IV. Literature survey

Inpaper[1]"In this work, a new method of blood vessel extraction which is an improvement over the previously developed matched filter, a new method of hemorrhages detection and classify the retinal cases using an advanced nonparametric method with higher classification accuracy.,

In paper [2This paper presents a framework to explore multi-field data of aneurysms occurring at intracranial and cardiac arteries by using statistical graphics. The rupture of an aneurysm is often a fatal scenario, whereas during treatment serious complications for the patient can occur.

Inpaper[3]This paper presents a framework to explore multi-field data of aneurysms occurring at intracranial and cardiac arteries by using statistical graphics. The rupture of an aneurysm is often a fatal scenario, whereas during treatment serious complications for the patient can occur.

In paper [4The retinal fundus images are commonly used for detecting analyzing of disease in disease affected images. Raw retinal fundus images are difficult to process by machine learning algos.

In paper [5] In this research article, a brief insight into the detection of DR in human eyes using different types of preprocessing segmentation techniques is being presented.

V. Future Scope

Scope of project includes we can use this in hospital. For detecting diabetic diseased using thermography images of an eye. Use of AI in medical diagnostics, especially in ophthalmology heralds a new era. If proven to be sensitive and specific enough this technology can totally change the way we look at screening programs and community-based ophthalmology programs. Most of the present systems use conventional of 30– 50° fundus images. Perhaps applications based on wide field imaging and OCT angiography based vascular analysis might yield even more consistent results. However, the high cost of wide field imaging and OCT angiography may be a limiting factor for this at present

VI. Conclusion

In the proposed work, a non-invasive procedure has been presented to evaluate the presence of diabetic diseases in the eye. The classification of diabetic diseased and normal eye IR images is done through Support Vector Machine classifier using various combination of texture and statistical features The simulation results indicate that the classifier in the detection of diabetic diseased eye performed in the accepted level and provide accuracy, sensitivity, specificity using CNN classifier..

References

[1].Segio B. Junior and D. Welfer, "Automatic Detection of Microaneurysms Ang Haemorrhages in Color Eye Fundus Images," Southeast Asian J Trop Med Public Heal., vol. 34, no. 4, pp. 751–757, 2003.

[2] S. S. Rahim, C. Jayne, V. Palade, and J. Shuttleworth, "Automatic detection of microaneurysms in colour fundus images for diabetic retinopathy screening," Neural Comput. Appl., vol. 27, no. 5, pp. 1149– 1164, 2016.

[3] S. S. Rahim, V. Palade, J. Shuttleworth, and C. Jayne, "Automatic Screening and Classification of Diabetic Retinopathy Fundus Images," Commun. Comput. Inf. Sci., vol. 459 CCIS, no. Dm, pp. 113–122, 2014.

[4] B. Antal and A. Hajdu, "Improving microaneurysm detection in color fundus images by using context-aware approaches," Comput. Med. Imaging Graph., vol. 37, no. 5–6, pp. 403–408, 2013.

[5] A. Sopharak, B. Uyyanonvara, and S. Barman, "Fine Microaneurysm Detection from Non-dilated Diabetic Retinopathy Retinal Images Using a Hybrid Approach," vol. II, pp. 6–9, 2012.

[6] K. M. Adal, D. Sidibé, S. Ali, E. Chaum, T. P. Karnowski, and F. Mériaudeau, "Automated detection of microaneurysms using scaleadapted blob analysis and semi-supervised learning," Comput. Methods Programs Biomed., vol. 114, no. 1, pp. 1–10, 2014.

[7].R. A. Welikala et al., "Automated detection of proliferative diabetic retinopathy using a modified line operator and dual classification," Comput. Methods Programs Biomed., vol. 114, no. 3, pp. 247–261, 2014.

[8].**Sharad Kumar Yadav, Shailesh Kumar, Basant Kumar, and R.Gupta "Comparative Analysis of Fundus Image Enhancement in Detection of Diabetic Retinopathy." Humanitarian Technology Conference (R10- HTC), 2016 IEEE Region 10, 21-23 Dec. 2016**