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A Lightweight Diabetic Retinopathy Detection Model Using A Deep Learning Technique

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ABSTRACT: Diabetes mellitus is the main cause of diabetic retinopathy, the most common cause of blindness worldwide. In order to slow down or prevent vision loss and degeneration, early detection and treatment are essential. For the purpose of detecting and classifying diabetic retinopathy on fundus retina images, numerous artificial intelligence-based algorithms have been put forth by the scientific community. Due to its real-time relevance to everyone's lives, smart healthcare is attracting a lot of interest. With the convergence of IoT, this attention has increased. The leading cause of blindness among persons in their working years is diabetic eye disease. Millions of people live in the most populous Asian nations, including China and India, and the number of diabetics among them is on the rise. To provide medical screening and diagnosis for this rising population of diabetes patients, skilled clinicians faced significant challenges. Our objective is to use deep learning techniques to automatically detect blind spots in eyes and determine how serious they may be. We suggest an enhanced convolutional neural network (ECNN) utilizing a genetic algorithm in this paper. The ECNN technique's accuracy results are compared to those of existing approaches like the K-nearest neighbor approach, convolutional neural network, and support vector machine with the genetic algorithm.

KEYWORDS: Decision Support Model, Multi-stage Fuzzy Logic, Cyberbullying and Banter, Classification, Mining Twitter Data

I.INTRODUCTION

Any diabetic patient, regardless of how severe their condition is, can develop DR, which is defined by increasing vascular disturbances in the retina brought on by persistent hyperglycemia [3]. Approximately 93 million people worldwide are thought to have DR, making it the largest cause of blindness among working-age adults [4]. The community has begun to pay attention to the confluence of AI and IoT for effective smart healthcare systems in recent years. This convergence makes the detection of many illnesses more effective than ever. One of the most common chronic diseases in the world, diabetes develops when the body is unable to properly use or manufacture the hormone insulin. According to the World Health Organization (WHO), diabetes was a factor in more than 1.6 million fatalities in 2016 [5–10]. Blood glucose levels in diabetic people frequently create high levels, which can harm and fail the body's organs. The International Diabetes Federation (IDF) reports that 1 in 10 persons have diabetes, which is a significant issue. Diabetes complications could lead to heart attacks, kidney failure, severe eyesight difficulties, etc. Although the electroretinography (ERG), retinal blood flow, and retinal blood vessel calibre may all play a role in the initial diagnosis of DR [11], fundus examination is the mainstay of early diagnosis in clinical settings [12].

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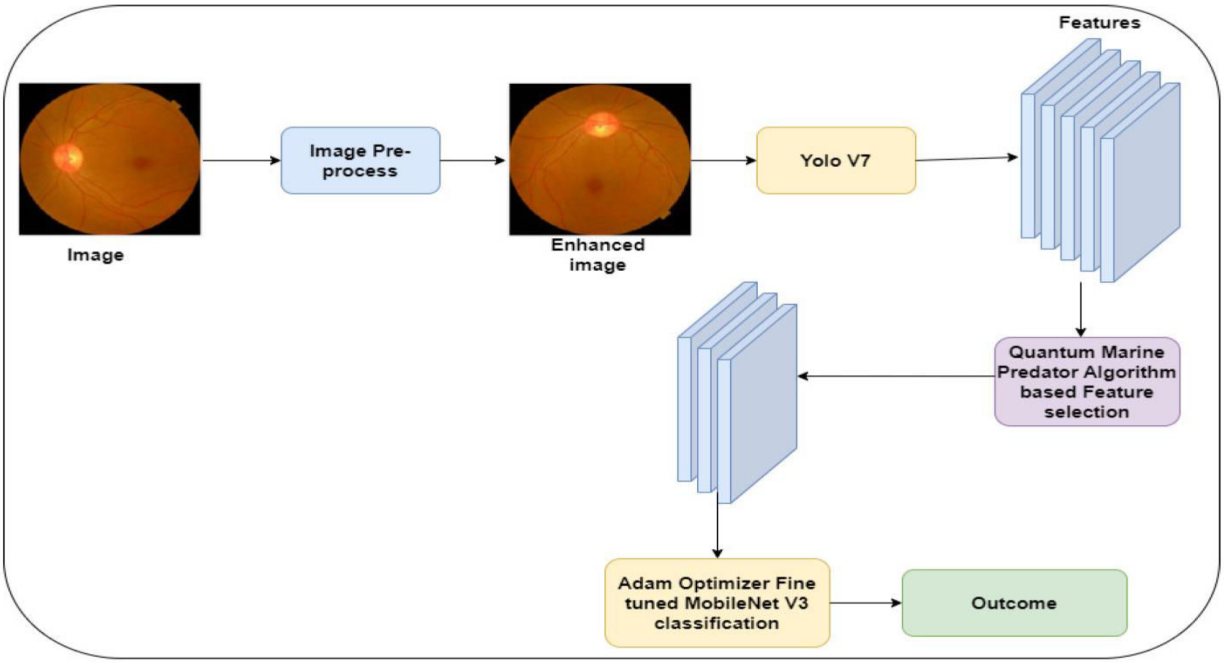

Fig 1: A Lightweight diabetic patient

One of the most popular ways to determine the degree of DR is by the use of fundus photography, a quick, noninvasive, well-tolerated, and widely accessible imaging technique [13]. Ophthalmologists use fundus pictures to view retina lesions at high resolution in order to diagnose and grade the severity of diabetic retinopathy. However, manually diagnosing DR from fundus images requires a high level of expertise and effort from a qualified ophthalmologist, particularly in densely populated or remote areas like in India and Africa, where the number of people with diabetes and DR is projected to increase dramatically in the coming years, while the number of ophthalmologists is disproportionally low [14–17]. The scientific community has been inspired to create computer-aided diagnosis methods in order to lessen the expense, time, and effort required for a medical expert to diagnose DR. Deep Learning (DL) applications for precise DR detection and categorization are now possible thanks to recent developments in artificial intelligence (AI) and the expansion of computer resources and capabilities. This review paper presents and critically analyzes new DL-based approaches for DR detection and classification that were published after 2016. Although numerous review publications on the use of deep learning techniques on DR have been published in recent years [18–29], the majority of them only cover particular facets of the pipeline for data processing and modeling.

II.REVIEW OF LITERATURE

Researchers have been focusing on connected smart health, the healthcare Internet of Things (Health IoT), and patient monitoring, all of which offer significant promise for AI and IoT technologies. AI techniques and technologies will improve the situation of world health, particularly for diabetic retinopathy. The numerous challenges and achievements in eye care were discussed by researchers, with a focus on the Indian community. They stated that efficient treatment and potential cures for a number of eye illnesses that may cause vision loss should be available in India by the year 2020. Organizing certification programs for technicians and physicians will help them get the knowledge and abilities necessary for DR identification at an early stage [1–3]. Numerous techniques have been put out to find DR. This section focuses on deep learning and neural network techniques for multiclass classification. Some researchers have classified fundus pictures into two categories: diabetic, which includes moderate to severe NPDR, and nondiabetic, which denotes the person does not have DR [4]. The authors proposed a method for precisely identifying a class into which a fundus picture may be classified based on these results using a single primary classifier and backpropagation neural organizing processes. Similar to this, a deep learning-based method has been developed for classifying fundus images for human ophthalmologist diagnosis. Based on Inception V3, the authors created a Siamese-like CNN binocular model that can give output from both eyes simultaneously and detect fundus images in both eyes [5]. The authors proposed a hybrid

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approach for DR detection in which the HE contract constrained adaptive histogram supports the deep learning model (CLACHE). The method uses visual augmentation during the diagnosing process to increase attention and effectiveness. For the dataset of individuals with diabetic retinopathy, the authors used five convolutional neural network (CNN) architectures to evaluate progress indicators. According to their classification system, images are split into three groups based on the severity of the disease [6, 7]. Model for diagnosing diabetic retinopathy utilizing convolutional neural networks like AlexNet, VggNet, GoogleNet, and ResNet is put forth. The model uses the classification of the fundus picture of DR into five classes to determine the patient's stage of DR. Additionally, the CNNs model was enhanced for greater accuracy with the use of transfer learning and hyper-parameter tuning, which was not possible when using nontransferred learning for noisy data. Images have been preprocessed using normalization and data augmentation techniques, and noise has been removed using nonlocal means denoising (NLMD) techniques [8–10].

In earlier research, the diabetic retinopathy was identified using a deep learning technology (DR) to capture the discriminative region of the input retina image. The enhanced convolutional neural network (ECNN) layer was examined in the network architecture provided by the authors to identify the total contribution to the final prediction made by the neuron. The authors' proposal distinguishes the precise location of severity in terms of vascular anomalies leads to greater performance.

III.METHODS

In order to address issues in computer vision, deep neural networks built on convolutional neural network models are increasingly commonly used. CNN-based and genetic algorithm approaches were used to distribute the dataset across normal and other types of diabetic retinopathy patients. The adopted CNN models are displayed systematically in the figure below, together with a genetic method for feature selection. By applying filter techniques like Gaussian filtering, it eliminates the input noise in the images. The feature extraction technique is used following the preprocessing procedure.

The quality of the photographs is improved by feature extraction since it helps to divide the pixel images into smaller and easier-to-manage images. A vital part of the image processing system is feature extraction. The construction of good classification accuracy is a result of the higher quality of the feature extraction.

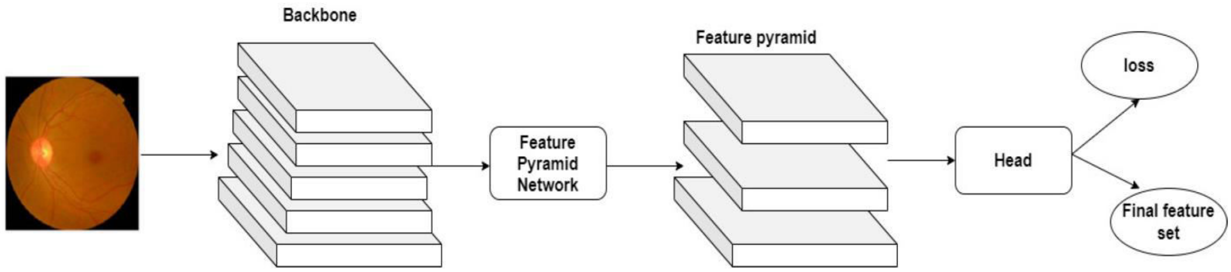

Fig 2:Improved by feature extraction

The input images for our suggested method are made up of the datasets that are provided, and the preprocessing operations are conducted using the Gaussian filter. Thus, it aids in the overall image processing process of removing noise. It contributes to the improved image quality. Feature extraction might happen after image processing is finished. A genetic algorithm can be used to handle the feature extraction.

Edge detection and image sharpening can be used to find the genetic algorithm. The overfitting in image processing is lessened as a result. The feature extraction can be finished before using the classification method. The convolutional neural network can be used to handle classification algorithms. It improves outcomes of the high quality of the photos and reduces overfitting in the input photographs.

IV.RESULT ANALYSIS

A genetic algorithm (GA) is an optimization technique that has been successfully applied in deep learning research. The GA model is an evolutionary search method that mimics the mechanisms of crossover, mutation, and selection found in nature. Feature selection is the process of selecting the most reliable and discriminating qualities while minimizing the high dimension of the feature space. GA is a metaheuristic feature selection method that starts the search and uncovers a wide range of alternatives. As an optimizer, GA will select the best option from a collection of possibilities.

The quality of the photographs is improved since every pixel inside the images depends on the surrounding pixel range.

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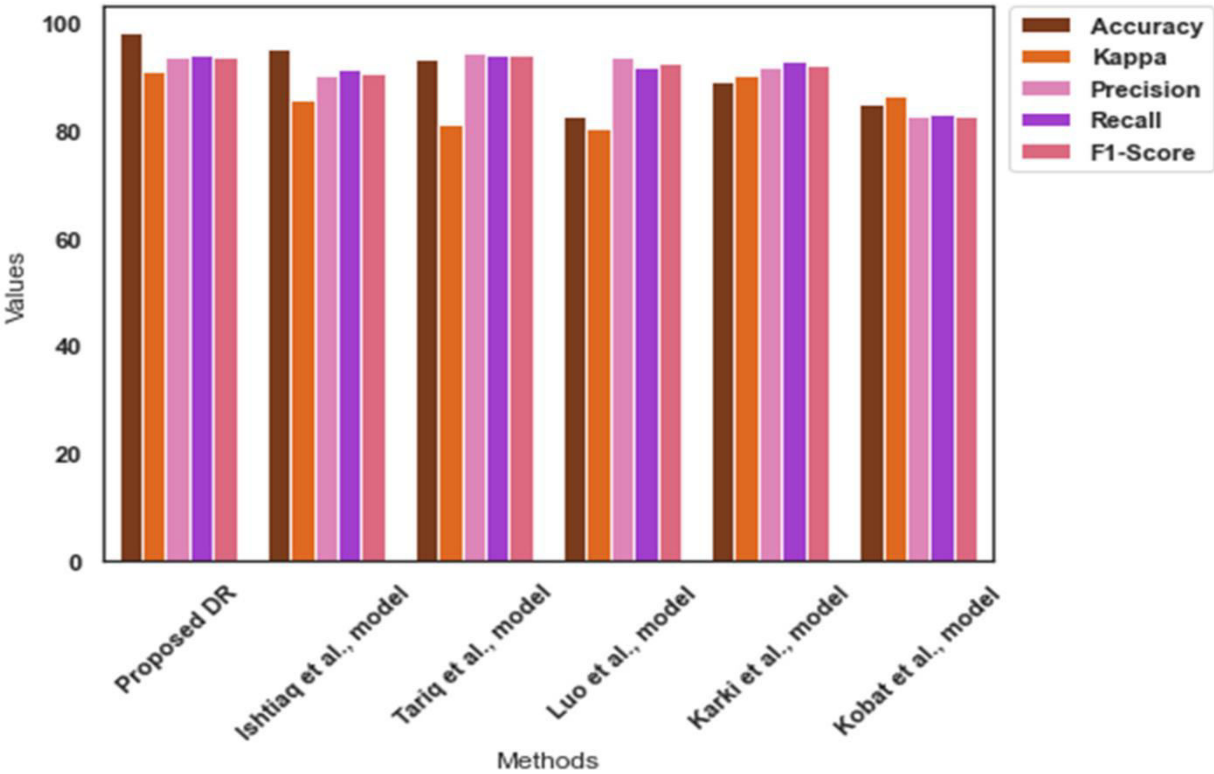

Fig 3: Result analysis

The final portion of the session gives the adding sequence in the complete image processing because the genetic algorithm's first step is to anticipate and choose the best spots in the image functions before performing the overfitting functions. The only factor on which the genetic algorithm depends is the system's fitness function.

Our proposed methods provide enhanced accuracy of the classifications. It gives gradually enhanced outputs when compared to the existing techniques. SVM with the genetic algorithm, convolutional neural networks with the genetic algorithm, and K- closest neighbors with the existing methods are the existing methodologies mentioned in this research. This paper implements enhanced output accuracy when compared to the existing techniques.

V.CONCLUSION

A major side effect of diabetes mellitus, diabetic retinopathy, causes gradual retinal degeneration and can even result in blindness. To stop it from getting worse and harming the retina, it is crucial to find and treat it early. Since numerous DL systems have evolved and been integrated into clinical practice, there has been an increase in interest in using them to diagnose diabetic retinopathy. This will help physicians treat patients more effectively and efficiently. In our paper, the categorization of eye retinal images is implemented using an enhanced convolutional neural network, and feature extraction is performed using a genetic method. As a result, the overfitting issue with image classifications is lessened, and the image quality is also improved. Although deep learning has set the door for more precise diagnosis and therapy, additional advancements in performance, interpretability, and ophthalmologist trustworthiness are still required.

REFERENCES

1. O. Daanouni, B. Cherradi, and A. Tmiri, "Automatic detection of diabetic retinopathy using custom CNN and grad-cam," *Advances on Smart and Soft Computing*, Springer, Singapore, pp. 15–26, 2021.
   View at: Google Scholar
2. R. Sarki, K. Ahmed, H. Wang, and Y. Zhang, "Automatic detection of diabetic eye disease through deep learning using fundus images: a survey," *IEEE Access*, vol. 8, pp. 151133–151149, 2020.
   View at: Publisher Site | Google Scholar

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| DOI:10.15680/IJMRSET.2024.0704148 |

3. A. Sungheetha and R. Sharma, "Design an early detection and classification for diabetic retinopathy by deep feature extraction based convolution neural network," *June 2021*, vol. 3, no. 2, pp. 81–94, 2021.
View at: Publisher Site | Google Scholar
4. F. J. Martinez-Murcia, A. Ortiz, J. Ramírez, J. M. Górriz, and R. Cruz, "Deep residual transfer learning for automatic diagnosis and grading of diabetic retinopathy," *Neurocomputing*, vol. 452, pp. 424–434, 2021.
View at: Publisher Site | Google Scholar
5. T. Kauppi, *Eye Fundus Image Analysis for Automatic Detection of Diabetic Retinopathy*, Lappeenranta University of Technology, Lappeenranta, Finland, 2010.
6. S. Gayathri, V. P. Gopi, and P. Palanisamy, "A lightweight CNN for Diabetic Retinopathy classification from fundus images," *Biomedical Signal Processing and Control*, vol. 62, Article ID 102115, 2020.
View at: Publisher Site | Google Scholar
7. I. J. Jacob and P. E. Darney, "Design of deep learning algorithm for IoT application by image based recognition," *September 2021*, vol. 3, no. 3, pp. 276–290, 2021.
View at: Publisher Site | Google Scholar
8. M. W. Rahman, S. S. Tashfia, R. Islam et al., "The architectural design of smart blind assistant using IoT with deep learning paradigm," *Internet of Things*, vol. 13, Article ID 100344, 2021.
View at: Publisher Site | Google Scholar
9. L. Jiang, L. Chen, T. Giannetsos, B. Luo, K. Liang, and J. Han, "Toward practical privacy-preserving processing over encrypted data in IoT: an assistive healthcare use case," *IEEE Internet of Things Journal*, vol. 6, no. 6, pp. 10177–10190, 2019.
View at: Publisher Site | Google Scholar
10. A. Das, P. Rad, K. K. R. Choo, B. Nouhi, J. Lish, and J. Martel, "Distributed machine learning cloud teleophthalmology IoT for predicting AMD disease progression," *Future Generation Computer Systems*, vol. 93, pp. 486–498, 2019.
View at: Publisher Site | Google Scholar
11. G. Selvachandran, S. G. Quek, R. Paramesran, W. Ding, and L. H. Son, "Developments in the detection of diabetic retinopathy: a state-of-the-art review of computer-aided diagnosis and machine learning methods," *Artificial Intelligence Review*, pp. 1–50, 2022.
View at: Publisher Site | Google Scholar

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