IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A Review: To Develop an Optimal Classifier for the Diagnosis of Diabetic Retinal Images using Computational Intelligence Techniques

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Abstract : *Use of computational strategies in the field of medication has been an area of extraordinary exploration as of late. Diabetic Retinopathy and Glaucoma are two retinal sicknesses that are a significant reason for visual deficiency. Regular Screening for early disease detection has been a highly labor - and resource- intensive task. Hence automatic detection of these diseases through computational techniques would be a great remedy. In this proposed work, order and discovery of exudates in shading retinal picture utilizing computerized procedure have been proposed.*

IndexTerms - MatLab, Nuero Solution Software, Microsoft excel, Various Transform Technique.

I. INTRODUCTION

Harm in the eye because of diabetes is called Diabetic retinopathy (DR) which might happen because of changes in blood glucose level that might prompt changes in retinal veins. It is regularly considered as the most well-known reason for vision misfortune for the beyond 50 years. Diabetic retinopathy is vision terrifying that happens in people with long standing diabetes with moderate harm to the retina of the eye and a main source of visual impairment among working grown-ups assuming it stays untreated. It very well may be seen during expanded eye assessment by an ophthalmologist or optometrist. Early recognition and appropriate treatment of DR can assist with keeping away from visual deficiency [1].DR is comprehensively grouped into proliferative diabetic retinopathy (PDR) and non-proliferative diabetic retinopathy (NPDR) . In case of PDR the veins in the retina of the eye get hindered and stay away from stream of blood in the eye. By which new, however feeble vessels start to frame on the retina which supply blood to the shut region. This status is called neo-vascularization. In case of NPDR additional liquid will get spilled from the harmed veins alongside little measure of blood. This situation leads to the formation of exudates in the retina of the eye. As the disease advances, the quantities of the exudates also gain. Figure 1 and Figure 2 show the normal retinal image and DR affected image.2016

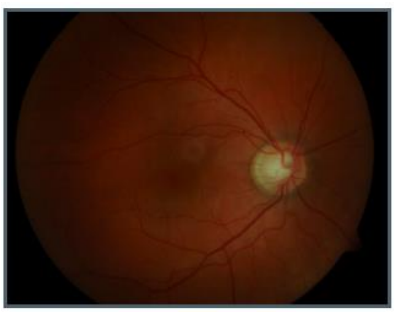

Fig.1. Normal retinal image

Fig.2. Diabetic Retinopathy infected image

Diabetic Retinopathy (DR) is the retinal bruise, caused by elevation of blood sugar levels, which can ultimately lead to vision impairment. According to the World Health Organization, It has been estimated that more than 75% of people who have diabetes for more than 20 years will have some form of Diabetic Retinopathy. Diabetic Retinopathy is asymptotic in the beginning and therefore many diabetic patients are not aware of their condition until it affects their vision. Early and regular screening of DR is therefore very important to prevent further complication or to control the progression of the disease. microaneurysms (MA) appear as tiny reddish dots in the peripheral retinal layers. With the progression of the disease, smaller vessels may close and new abnormal blood vessels begin to grow in the retina and are referred to as proliferative stage. This stage may lead to vision impairment and if not treated properly would eventually turn to vision loss.

Research in the field of medication proposes that unusual tension and glucose levels are a significant reason for a few basic sicknesses. Such abnormality can prompt different entanglements in different organs of the body. In this Purposed work we put center around Diabetic Retinopathy, the previous being a problem in the retina of the eye made fundamentally due Diabetes prompting blemished/loss of vision and the last option being related with raised tension in the eye making harm the optic nerve .Diabetic Retinopathy are asymptomatic in the primer stages and discoveries uncover that treatment might be valuable just when identified early. Standard screening of individuals who have high gamble of the sickness might assist with distinguishing the infection at a beginning phase. Identifying retinal irregularities in countless pictures produced by screening programs is a period , asset and work - serious errand. Programmed location of the sickness from the retinal pictures is accordingly a significant area of progressing research.

Contribution: In this work, the digital retinal fundus images are classified into diabetic or non-diabetic; Diabetic image contains mild to severe signs of non-proliferative DR and nondiabetic does not contain any microaneurysms (MA). The method proposed in this work is to correctly assign the class to which a retinal fundus image could be classified using one rule classifier and back propagation neural network (BPNN) techniques.

***Advantages*:**

1) Diabetic Retinopathy diagnosis is an arduous task that needs to be executed scrupulously. The computerization of this system will be extremely advantageous.

2) Clinical judgments are usually made based on medical practitioner's perception and wisdom rather on the technical information available in the database.

3) It is not easy for a doctor to have expertise in every subspecialty. This leads to unwanted prejudices, mistakes and unnecessary medical expenses that might affect the quality of service provided to patients.

II. LITERATURE REVIEW

Till date what is the status of the related research work has been inspected hear A number of techniques have been deployed for Diabetic Retinal Images classification.

Diabetic retinopathy and Glaucoma are the two most threatening retinal diseases which lead to deteriorated vision or vision loss in patients. Diabetic Retinopathy is detected by a number of abnormal structures viz, microneurysms, hemorrhages, exudates, cotton wool spots etc. Glaucoma detectors include the cup to disc ratio (CDR), ratio of the distance between optic disc center and optic nerve head to diameter of the optic disc, and the ratio of blood vessels area in inferior-superior side to area of blood vessel in the nasaltemporal side (ISNT ratio). Different attempts in the past have been made to automatically detect the presence of diabetic retinopathy and Glaucoma, some of which are summarized here.

Fuzzy C-Means based clustering and Artificial Neural Networks (ANN) was used to classify exudates yielding a sensitivity and specificity of 95 and 88.9% [3]. Changira et.al, [4] designed a system in which Principle Component Analysis (PCA) and multi layer perception neural networks were used demonstrating a sensitivity and specificity of 80.21 and 70.26% respectively. Sagar [5] adopted dynamic thresholding and edge detection to identify the exudates providing a sensitivity and prediction of 99 and 93%. In 2008, Clara used Fisher's linear discriminant analysis, providing a sensitivity of 88% in identification of hard exudates [6]. ANN with inputs viz. areas of hard exudates, area and perimeter of blood vessels and the contrast showed a classification accuracy of 93% [7]. SVM with inputs from Higher Order Spectra classified with a sensitivity and specificity of 82 and 88% respectively [8].

Fuzzy C-Means clustering to intensity, standard deviation, hue and number of edge pixels detected exudates with an accuracy of 99.11% [9]. In 2010, Vijaya et.al, proposed a system that detected exudates using feature extraction, template matching and MDD classifiers [10] classify 38 from 39 images. Back Propagation Neural network with inputs *viz.*hue, intensity, mean intensity, standard deviation intensity and distance between optic disc and intensity of optic disc eliminated image showed an accuracy of 98.45% [11]. Recurrent Echo State Neural Network and Fuzzy C-Means clustering on standard deviation, intensity, edge strength and compactness of the disease related features demonstrated sensitivity and specificity of 93 and 100% [12]. Microneurysms and hemorrhages, extracted using vessel enhancement [13] on DiaRetDB data provided a sensitivity of 57.4%, 35.37% and 62.68% for ophthalmologists 1, 2 and 3 respectively. Coarse segmentation using morphology techniques and fine segmentation using Bayes Naïve classification to detect the microneurysms [14] revealed 18 per pixel features yielding an accuracy of 99.99%. ANN with Singular Value Decomposition and PCA detected hemorrhages and exudates with an accuracy of 95 to 98% [15]. A fuzzy inference system identified exudates from a threshold, optic disc removed image [16] with accuracy of 93.84%. Various attempts have also been made in the past to automatically diagnose the presence of Glaucoma. Neural networks with inputs: CDR and ISNT ratio, calculated from the extracted optic disc and blood vessels [17], performed with a sensitivity and specificity of 100% and 80% respectively. The texture and Higher Order Spectra features [18] after z-score normalization and feature selection, and

when combined with a random-forest classifier, correctly identified the glaucoma images with an accuracy of more than 91%. K means clustering which was used in extraction of optic disc and hence in CDR calculation gave 90% match with clinical CDR [19]. Ho et.al, [20] proposed a system that involved vessel detection, vessel in painting, CDR calculation [21] and neuro-retinal rim for ISNT rule. K-Nearest Neighbor, SVM and Bayes Classifier with CDR and ISNT ratio [22] yielded a classification accuracy of 95%. CDR and ISNT Ratio using Neural Networks and SVM [23] gave a sensitivity of 99%.

Thus the existing work first primarily focused on extracting the disease related structures and calculating relevant measurements that served as input to the classifiers that ultimately detect the presence or absence of the disease.

From the rigorous review of the above mentioned papers , it is observed that no method has reported accuracy of more than 95%. We need to improve the accuracy and for that a new system is required to be developed.

III. PROPOSED METHODOLOGY

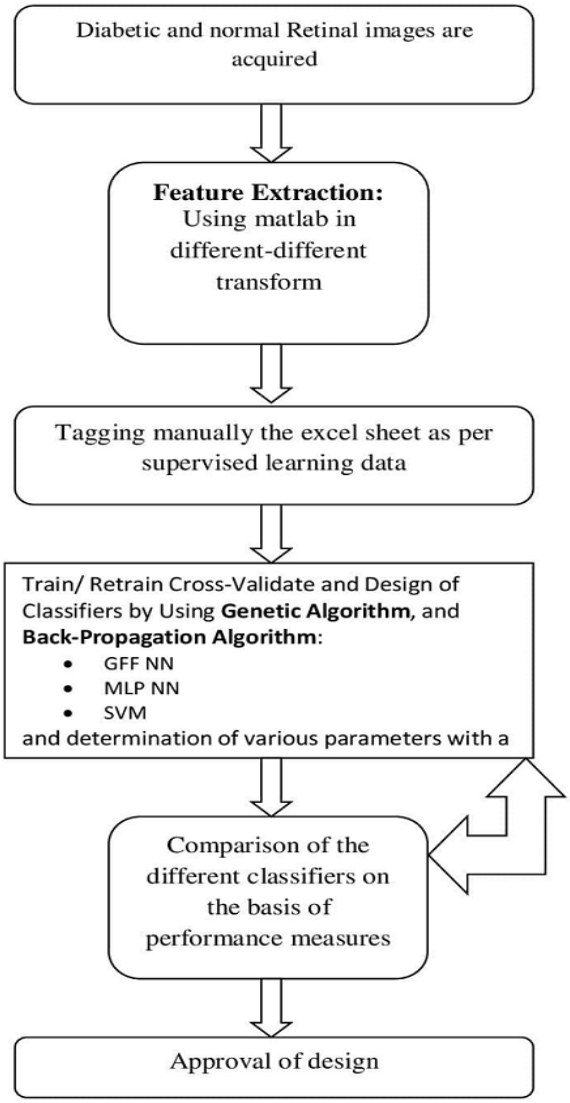

Figure 2:Flow chart

Computational Intelligence techniques include the following will established techniques.

i) Statistics
ii) Image processing
iii) Learning Machines such as neural network .
iv) Transformed domain techniques such as FFT, DCT,WHT etc.

For choice of suitable classifier following configuration will be investigated.

i) Multilayer perceptron Neural network.
ii) Support vector machine.
iii) Generalized Feed Forward Neural Network

For each of the architecture, following parameters are verified until the best performance is obtained.

i) Train-CV-Test data
ii) Retraining at least five times with different random initialization of the connection weights in every training run.

iii) Possibility different learning algorithms such as **Genetic Algorithm, Standard Back-Propagation algorithm**, Conjugate gradient, Quick propagation, Delta Bar Delta, Momentum Learning Rules.

iv) Number of hidden layers
v) Number of processing elements of neurons in each hidden layer.

After regions training & retraining of the classifier, it is cross validated & tested on the basis of the following performance matrix.

i) Mean Square Error
ii) Normalized Mean Square Error
iii) Classification accuracy

In order to carry out the proposed research work, Platforms/Software's such as Matlab, Neuro solutions, Microsoft Excel will be used.

Research Objectives:

i)To maintain the correctness & accuracy in the diagnosis of retinal abnormalities even though the input images are contaminated by known or unknown noise.
ii)To increase the classification accuracy for the diagnosis of retinal abnormalities.

Implications:

Use of the proposed optimal classifier based on Computational Intelligence techniques will be result in more accurate and reliable diagnosis of Diabetic Retinopathy.

Using our system, ophthalmologist can diagnosed Diabetic Retinopathy with enough confidence. Moreover, our system can also be used by the experts in order to confirm their diagnostic decision.

IV. Conclusion

This paper demonstrated how to using artificial neural networks(ANN)could be used to build accurate diagnosed Diabetic Retinopathy and i am also try to achieved result more accurate and reliable.

V. Acknowledgment

We are very grateful to our HVPM College of Engineering and Technology to support and other faculty and associates of ENTC department who are directly & indirectly helped me for these paper

References

[1] R.S.Rajkumar,T Jagathishkumar,Divi Ragul,Dr. A. Grace Selvarani," Transfer Learning Approach for Diabetic Retinopathy Detection using Residual Network, 978-1-7281-8501-9/21/$31.00 ©2021 IEEE
[2] Lifeng Qiao, Ying Zhu, Hui Zhou," Diabetic Retinopathy Detection using Prognosis of Microaneurysm and Early Diagnosis System for Non - Proliferative Diabetic Retinopathy Based on Deep Learning Algorithms, 2020.2993937, IEEE Access.
[3] A Osareh et.al,, "Automated identification of diabetic retinal exudates in digital colour images", British Journal of Opthalmol, vol. 87, pp. 1220- 1223, 2003.
[4] Chanjira Sinthanayothin, et.al,. "Automated Screening System for Diabetic Retinopathy". Proc. Of the 3rd International Symposium on Image and Signal Processing and Analysis, 2003, vol. 15, pp. 915-920.
[5] Anantha Vidya Sagar, S.Balasubramaniam and V.Chandrasekaran, "A Novel Integrated Approach using Dynamic Thresholding and Edge Detection (IDTED) for Automatic Detection of Exudates in Digital Fundus Retinal Images", Proc. of the International Conference on Computing: Theory and Applications, 2007, pp. 705-710.
[6] Clara I. Sanchez et.al, "A novel automatic image processing algorithm for detection of hard exudates based on retinal image analysis", Medical Engineering and Physics, vol. 30, pp. 350-357, 2008.
[7] Jagadish Nayak et.al, "Automated Identification of Diabetic Retinopathy Stages Using Digital Fundus Images', Journal of Medical Systems, vol.32, pp. 107-115, 2008.
[8] Rajendra Acharya U et.al, "Application of Higher Order Spectra for the Identification of Diabetes Retinopathy Stages", Journal of Medical Systems, vol. 32, pp. 481-488, 2008.
[9] Akara Sopharak, Bunyarit Uyyanonvara and Sarah Barman, "Automatic exudate detection from non-dilated diabetic retinopathy retinal images using fuzzy C-means clustering", Sensors, vol.9, no. 3, pp. 2148-2161, 2009.
[10] V. Vijaya Kumari and N. SuriyaNarayanan, "Diabetic Retinopathy-Early Detection Using Image Processing Techniques", International Journal of Computer Science and Engineering, vol. 2, no. 2, pp. 357-361, 2010.
[11] Asha Gowda Karegowda et.al, "Exudates detection in retinal images using back propagation neural network", International Journal of Computer Applications, vol. 25, no. 3, pp. 25-31, 2011.
[12] C.Jayakumari and R.Maruthi, "Longitudinal time-series of color retinal Fundus Image for Diabetic Retinopathy", International Journal of Computer Applications, vol. 33, no. 10, pp. 43-46, 2011.
[13] R. Vidyasari, I. Sovani, T.L.R. Mengko and H. Zakaria, "Vessel Enhancement Algorithm in Digital Retinal Fundus Microaneurysms Filter for Nonproliferative Diabetic Retinopathy Classification", Proc. Of International Conference on Instrumentation, Communication, Information Technology and Biomedical Engineering, 2011, pp. 278-281.
[14] Akara Sopharak, Bunyarit Uyyanonvara and Sarah Barman, "Fine Microaneurysm Detection from Non-dilated Diabetic Retinopathy Retinal Images Using a Hybrid Approach", Proc. of the World Congress on Engineering, 2012, vol. 2.
[15] Archana Deka and Kandarpa Kumar Sarma, "SVD and PCA Features for ANN based Detection of Diabetes Using Retinopathy", Proceedings of the CUBE International Information Technology Conference, 2012, pp. 38-41.
[16] M. Ponni Bala and S. Vijayachitra, "Computerised Retinal Image Analysis to Detect and Quantify Exudates Associated with Diabetic Retinopathy", International Journal of Computer Applications, vol. 34, no. 2, pp. 7-12, 2012.

[17] Jagadish Nayak, Rajendra Acharya U. P. Subbanna Bhat, Nakul Shetty and Teik-Cheng Lim, "Automated Diagnosis of Glaucoma Using Digital Fundus Images", Journal of Medical Systems, vol.33, no. 5, 337-346, 2009
[18] U. Rajendra Acharya, Sumeet Dua, Xian Du, Vinitha Sree S, and Chua Kuang Chua, "Automated Diagnosis of Glaucoma Using Texture and Higher Order Spectra Features", IEEE Transactions on Information Technology in Biomedicine, vol. 15, no. 3, 2011.
[19] T. R. Ganesh Babu and S. Shenbagadevi, "Automatic Detection of Glaucoma Using Fundus Image", European Journal of Scientific Research, vol. 59, no.1, pp. 22-32, 2011
[20] Chih-Yin Ho et.al, "An Atomatic Fundus Image Analysis System for Clinical Diagnosis of Glaucoma", International Conference on Complex, Intelligent and Software Intensive Systems, 2011, pp. 359-364.
[21] Naoto Inoue, et.al, "Development of a simple diagnostic method for the glaucoma using ocular Fundus pictures", Proc. of the 2005 IEEE Engineering in Medicine and Biology, 2005, vol. 4, pp.3355-3358.
[22] K.Narasimhan and K.Vijayarekha, "An Efficient Automated System For Glaucoma Detection Using Fundus Image", Journal of Theoretical and Applied Information Technology, vol. 33, no. 1, pp. 104-110, 2011.
[23] Wisam Shehadeh, Mohammad Rousan and Ahmed Ghorab, "Automated Diagnosis of Glaucoma using Artificial Intelligent Tech