

# LITERATURE SURVEY

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Title of the paper	Author(s)	<i>Name of the journal</i>	Published year	Abstract
Classification of retinal images with deep learning for early detection of diabetic retinopathy disease	Nursel Yalcin,Seyfullah Alver,Necla Uluhatur	IEEE XPLORE	02-05, May 2018	Diabetic retinopathy is the most common cause of blindness of the eye depend on diabetes. For this reason, early detection of diabetic retinopathy is of critical importance. In this study, a deep learning-based approach is presented for the early detection of diabetic retinopathy from retinal images. The proposed approach consists of two steps. In the first stage, pretreatments were performed to remove retinal images from different data sets and standardize them to size. In the second stage, classification was made by Convolutional Neural Network which is a deep learning algorithm and 98.5% success was achieved. The most prominent difference of this study from similar studies is that instead of creating the feature set manually as in traditional methods, the deep learning network automatically constructs itself in a very short time by using the CPU and GPU in training phase.

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<u>Diabetic Retinal Fundus ImagesPreprocessing and Feature Extraction for Early Detection of Diabetic Retinopathy</u>	Dilip Singh Sisodia, Shruti Nair and Pooja Khobragade	Biomedical and Pharmacology Journal	30, May 2017	The investigation of clinical reports suggested that more than ten percent patients with diabetes have a high risk of eye issues. Diabetic Retinopathy (DR) is an eye ailment which influences eighty to eighty-five percent of the patients who have diabetes for more than ten years. The retinal fundus images are commonly used for detection and analysis of diabetic retinopathy disease in clinics. The raw retinal fundus images are very hard to process by machine learning algorithms. In this paper, pre-processing of raw retinal fundus images are performed using extraction of green channel, histogram equalization, image enhancement and resizing techniques. Fourteen features are also extracted from pre-processed images for quantitative analysis. The result attributed due to its complete absence in normal diabetic images and its simultaneous presence in the three classes of diabetic retinopathy images namely

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Automated Identification of Diabetic Retinopathy Using Deep Learning	RishabGargeya, TheodoreLengMD, MS	ScienceDirect	27, March 2017	Diabetic retinopathy(DR) is one of the leading causes of preventable blindness globally. Performing retinal screening examinations on all diabetic patients is an unmet need, and there are many undiagnosed and untreated cases of DR. The objective of this study was to develop robust diagnostic technology to automate DR screening. Referral of eyes with DR to an ophthalmologist for further evaluation and treatment would aid in reducing the rate of vision loss, enabling timely and accurate diagnoses.

Title of the paper	Author(s)	<i>Name of the journal</i>	Published year	Abstract
Early detection of diabetic retinopathy based on deep learning and ultra-wide-field fundus images	<u>Kangrok Oh, Hae Min</u> <u>Kang, Dawoon</u> <u>Leem, Hyungyu</u> <u>Lee, Kyoung Yul</u> <u>Seo &amp; Sangchul Yoon</u>	Scientific Reports	21, January 2021	Visually impaired and blind people due to diabetic retinopathy were 2.6 million in 2015 and estimated to be 3.2 million in 2020 globally. Though the incidence of diabetic retinopathy is expected to decrease for high-income countries, detection and treatment of it in the early stages are crucial for low-income and middle-income countries. However, most automatic systems utilize conventional fundus photography, despite ultra-wide-field fundus photography provides up to 82% of the retinal surface. In this study, we present a diabetic retinopathy detection system based on ultra-wide-field fundus photography and deep learning. In experiments, we show that the use of early treatment diabetic retinopathy study 7-standard field image extracted from ultra-wide-field fundus photography outperforms that of the optic disc and macula centered image in a statistical sense.

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Detection of diabetic retinopathy using deep learning methodology	Gazala Mushtaq and Farheen Siddiqui	IOP SCIENCE	4-5, December 2020	Diabetic retinopathy is a complication of diabetes that targets the eyes by damaging the retinal blood vessels. Initially it is asymptomatic or causes fluctuating vision problems. As it becomes severe, it affects both the eyes and eventually causes partial or complete vision loss. Primarily occurs when the blood sugar level is unmanageable. Therefore, the person with diabetes mellitus is always at a high risk of acquiring this disease. present work considers a deep learning methodology specifically a Densely Connected Convolutional Network DenseNet-169, which is applied for the early detection of diabetic retinopathy. The datasets that are taken into consideration are Diabetic Retinopathy Detection 2015 and Aptos 2019 Blindness Detection which are both obtained from Kaggle. Our proposed model achieved 90% of accuracy. The Regression model was also employed, manifested up an accuracy of 78%. The main

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Early Detection of Diabetic Retinopathy Using PCA-Based Deep Learning Model	<u>Thippa ReddyGadekallu</u> , Neelu Khare,Sweta Bhattacharya,Saurabh Singh,Praveen Kumar Reddy Maddikunta,In-Ho Ra and Mamoun Alazab	MDPI	5, February 2020	Diabetic Retinopathy is a major cause of vision loss and blindness affecting millions of people across the globe. Although there are established screening methods - fluorescein angiography and optical coherence tomography for detection of the disease but in majority of the cases, the patients remain ignorant and fail to undertake such tests at an appropriate time. dataset collected from the UCI machine learning repository. At its inception, the raw dataset is normalized using the Standard scalar technique and then Principal Component Analysis (PCA) is used to extract the most significant features in the dataset. Further, Firefly algorithm is implemented for dimensionality reduction. The results generated from the model is evaluated against the prevalent machine learning models and the results justify the superiority of the proposed model in terms of Accuracy, Precision, Recall, Sensitivity and Specificity

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Deep Learning Approach to Diabetic Retinopathy Detection	Borys Tymchenko, Philip Marchenko, Dmitry Spodarets	arXiv	3, March 2020	Diabetic retinopathy is one of the most threatening complications of diabetes that leads to permanent blindness if left untreated. One of the essential challenges is early detection, which is very important for treatment success. Simplification of the detection step is crucial and can help millions of people. Convolutional neural networks (CNN) have been successfully applied in many adjacent subjects, and for diagnosis of diabetic retinopathy itself. However, the high cost of big labeled datasets, as well as inconsistency between different doctors, impede the performance of these methods. In this paper, we propose an automatic deep-learning-based method for stage detection of diabetic retinopathy by single photography of the human fundus. Additionally, we propose the multistage approach to transfer learning, which makes use of similar datasets with different labeling.



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Indian Diabetic Retinopathy Image Dataset (IDRiD)-A Database for Diabetic Retinopathy Screening Research	Prasanna Porwal,Samiksha Pachade,Ravi Kamble,Manesh Kokare,Girish Deshmukh,Vivek Sahasrabuddhe and Fabrice Meriaudeau	MDPI	10, July 2018	Diabetic Retinopathy is the most prevalent cause of avoidable vision impairment, mainly affecting the working-age population in the world. Recent research has given a better understanding of the requirement in clinical eye care practice to identify better and cheaper ways of identification, management, diagnosis and treatment of retinal disease. The importance of diabetic retinopathy screening programs and difficulty in achieving reliable early diagnosis of diabetic retinopathy at a reasonable cost needs attention to develop computer-aided diagnosis tool. Diverse and representative retinal image sets are essential for developing and testing digital screening programs and the automated algorithms at their core.. The dataset provides information on the disease severity of diabetic retinopathy, and diabetic macular edema for each image. This makes it perfect for development and evaluation of image analysis

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Detection of Diabetic Retinopathy and Maculopathy in Eye Fundus Images Using Fuzzy Image Processing	Sarni Suhaila Rahim, Vasile Palade, Chrisina Jayne, Andreas Holzinger & James Shuttleworth	Springer	01, January 2015	Diabetic retinopathy is a damage of the retina and it is one of the serious consequences of the diabetes. Early detection of diabetic retinopathy is extremely important in order to prevent premature visual loss and blindness. This paper presents a novel automatic detection of diabetic retinopathy and maculopathy in eye fundus images using fuzzy image processing. The developed system consists of image acquisition, image preprocessing with a combination of fuzzy techniques, feature extraction, and image classification by using several machine learning techniques. The fuzzy-based image processing decision support system will assist in the diabetic retinopathy screening and reduce the burden borne by the screening team.

Title of the paper	Author(s)	<i>Name of the journal</i>	Published year	Abstract
Diabetic Retinopathy Detection Using Machine Learning and Texture Features	Mohamed Chetoui,Moulav A. Akhloufi, Mustan ha Kardouchi	IEEE XPLORE	13-16, May 2018	Diabetic retinopathy (DR) is a medical condition due to diabetes mellitus that can damage the patient retina and cause blood leaks. This condition can cause different symptoms from mild vision problems to complete blindness if it is not timely treated. Hemorrhages, hard Exudates, and Micro-aneurysms (HEM) that appear in the retina are the early signs of DR. Textures features such as LBP have been widely used in the past as a technique for DR detection. In this work, we introduce the use of different texture features for DR, mainly Local Ternary Pattern (LTP) and Local Energy-based Shape Histogram (LESH). We show that they outperform LBP extracted features. Support Vector Machines (SVM) are used for the classification of the extracted histogram. Similarly, the analysis of the ROC curve shows that LESH with SVM-RBF gives the best AUC (Area Under Curve) performance with 0.931.

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Deep Convolutional Neural Network-Based Early Automated Detection of Diabetic Retinopathy Using Fundus Image	Kele Xu,Dawei Feng and Haibo Mi	MDPI	23 , November 2017	The automatic detection of diabetic retinopathy is of vital importance, as it is the main cause of irreversible vision loss in the working-age population in the developed world. The early detection of diabetic retinopathy occurrence can be very helpful for clinical treatment; although several different feature extraction approaches have been proposed, the classification task for retinal images is still tedious even for those trained clinicians. Recently, deep convolutional neural networks have manifested superior performance in image classification compared to previous handcrafted feature-based image classification methods. Thus, in this paper, we explored the use of deep convolutional neural network methodology for the automatic classification of diabetic retinopathy using color fundus image, and obtained an accuracy of 94.5% on our dataset, outperforming the results obtained by using classical approaches.

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A Literature Survey On Defect Detection Mechanisms in Retina	Balaji S, Shree Divya R, Chitra B	Ijert	26, September 2013	Diabetic Retinopathy is the most common cause of blindness and vision loss to the human eye. Micrianeurysms should be considered as one of the major symptom of early blindness, for this, the detection of microaneurysms should be done well in advance. Several methods have been proposed not only to detect microaneurysms but also to detect haemorrhages, exudates etc. which should be considered as another major symptoms. The existing techniques has drawback that need to be focused. The survey presents very recent research on severity classification of microaneurysms and recommends neuro fuzzy could be applied to get a better performance.

Title of the paper		Author(s)	<i>Name of the journal</i>	Published year	Abstract
Retinal Image Analysis: A Review		S.R.Nirmala, Malaya Kumar Nath and Samarendra Dandapa	ResearchGate	01, January 2011	Images of the eye ground or retina not only provide an insight to important parts of the visual system but also reflect the general state of health of the entire human body. Automated retina image analysis is becoming an important screening tool for early detection of certain risks and diseases like diabetic retinopathy, hypertensive retinopathy, age related macular degeneration, glaucoma etc. This can in turn be used to reduce human errors or to provide services to remote areas. In this review paper, we discuss some of the current techniques used to automatically detect the important clinical features of retinal image, such as the blood vessels, optic disc and macula. The quantitative analysis and measurements of these features can be used to better understand the relationship between various diseases and the retinal features.

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Literature Review on the Diabetic Retinopathy in Retinal Images	Mona N. Alsaleem, Mohamed A. Berbar	Academia	11, NOVEMBER 2019	Diabetes is one of the most harmful disease of our age and that's because of the fast and unhealthy pace of our lives. Diabetes is Diabetic Retinopathy that might lead to total loss of sight in the diabetic patients and that's if it is not detected and medicated early, for the importance of early detection of this disease there is a great effort in the literature to early detect Diabetic Retinopathy, literature review is introduced in report to cover the different aspects of retinopathy and its detection methods. In this review we try to cover a great part of the literature is based on two parts: the first part about the detection of the lesions of the Diabetic Retinopathy including hemorrhages, microaneurysms and exudates. The second part is about the measuring of different severity level of diabetic retinopathy and its detection and classification systems.

Title of the paper	Author(s)	<i>Name of the journal</i>	Published year	Abstract
Review of Deep Learning Algorithms and Architectures	Ajay Shrestha, Ausif Mahmood	IEEE XPLORE	22 ,April 2019	Deep learning (DL) is playing an increasingly important role in our lives. It has already made a huge impact in areas, such as cancer diagnosis, precision medicine, self-driving cars, predictive forecasting, and speech recognition.In many cases, depending on the problem complexity, DL can also overcome the limitations of earlier shallow networks that prevented efficient training and abstractions of hierarchical representations of multi-dimensional training data. Deep neural network (DNN) uses multiple (deep) layers of units with highly optimized algorithms and architectures. We describe current shortcomings, enhancements, and implementations. The review also covers different types of deep architectures, such as deep convolution networks, deep residual networks, recurrent neural networks, reinforcement learning, variational autoencoders, and others.