**LITERATURE SURVEY**

Diabetic Retinopathy (DR) is a common complication of diabetes mellitus, which causes lesions on the retina that effect vision. If it is not detected early, it can lead to blindness. Unfortunately, DR is not a reversible process, and treatment only sustains vision. DR early detection and treatment can significantly reduce the risk of vision loss. The manual diagnosis process of DR retina fundus images by ophthalmologists is time-, effort-, and cost-consuming and prone to misdiagnosis unlike computer-aided diagnosis systems. Recently, deep learning has become one of the most common techniques that has achieved better performance in many areas, especially in medical image analysis and classification. Convolutional neural networks are more widely used as a deep learning method in medical image analysis and they are highly effective. For this article, the recent state-of- the-art methods of DR color fundus images detection and classification using deep learning techniques have been reviewed and analyzed. Furthermore, the DR available datasets for the color fundus retina have been reviewed.

The related work in the field of medical sciences as well as machine learning, shows that researchers have proposed and implemented various machine learning methods, but the study comparative study among these deep learning methods is still lacking for as far as Diabetic Retinopathy is concerned. The work done hence proves to be a novel approach while considering the results and fining for various machine learning algorithms for DR. Raman et al. focuses on developing of computer-aided detection mechanism for finding abnormality of the retinal imaging, while detecting the existence of abnormal features from the retinal fundus images. Their proposed methodology focuses on enhancing images, filtering of the noise, detection of the blood vessels and identifying optic disc, extracting exudates and the micro aneurysms (MA), extracting features and classifying various stages of the diabetic retinopathy as mild, the moderate, the severe NPDR(Non-Proliferative Diabetic Retinopathy) and the PDR(Proliferative Diabetic Retinopathy) by the use of machine learning techniques. Singh&Tripathi used Image analysis techniques for the automated and early discovery of the Diabetic Retinopathy, by the use of Image processing among many other analysis techniques. Soomro et al. in their research, proposed an image enhancement technique on the basis of morphological operation accompanied bythe proposed threshold centered static wavelet transforms for the retinal fundus image in addition to CLAHE (Contrast Limited Adaptive Histogram Equalisation) for vessel enhancement.

Zhao et al. in their paper, proposed a novel saliency- based technique for detecting of the leakage in the fluoresce in angiography. Their proposed methodology is validated using only two publiclyaccessible datasets which are Diabetic Retinopathy and Malarial Retinopathy. Prasad et al. proposed use of the morphological operations along withthe segmentation procedures for detecting the blood vessels, micro aneurysms and the. The PCA (Principal Component Analysis) is applied for improved feature selection. Further, Back-propagation NN and the one-rule classifier methods were deployed for classification of images as non-diabetic or diabetic.M. Usman Akram et al approach is based on a hybrid classifier detecting the retinal lesions by preprocessing, extracting lesions from candidate, formulation of feature followed by classification. The work leads to further extension of m-Mediods based modeling methodology, combining it with Gaussian Mixture Model so to form some hybrid classifier in order to improve accuracy of classification. Winder, R. John, et al survey based on algorithms for automatic detection of retinopathy while considering digital color retinal images. The algorithms considered for study were categorized in 5 stages (preprocessing, localization and segmentation of the optic disk, segmentation of the retinal vasculature, localization of the macula and fovea, localization and segmentation of retinopathy). Haleem, Muhammad Salman, et al a paper surveys advanced methods for automatic extraction of the anatomical features in order to assist the early diagnosis of Glaucoma, from the retinal images. They carried out critical estimations of existing automatic extraction approaches based on the features comprising of CDR (Optic Cup to Disc Ratio), RNFL (Retinal Nerve Fiber Layer), and PPA (Parapapillary Atrophy) among others. The paper tabulated possible technique and their accuracy results very precisely. Gardner et al. worked on determining that if neural networks are able to detect the diabetic features prevailing in the fundus images along with comparing network against ophthalmologist screening set of the fundus images. The work showed the detection of hemorrhages, exudates and vessels. Further comparing with ophthalmologist, their network attained better accuracy for detection of the Diabetic Retinopathy. Roychowdhury et al. in their paper, contributed to the reduction of number of features to be used for the lesion classification by the feature ranking by the use of Adaboost. They proposed novel two-step hierarchical classification approach where non-lesions or the false positives are discarded in first step. And in second step, bright lesions are further classified as the hard exudates along with the cotton wool spots. Also red lesions remain classified as the hemorrhages and the micro-aneurysms (MA).Rakshitha et al. work throws light on uses of the new imaging transformation methods for the enhancement of the retinal images like contourlet transform, curvelet transform and wavelet transform. Their paper thus draws comparison among these three imaging transformations. Vo et al. research studies discriminant texture features which are obtained by the color multi-scale uniform LBPs(Local Binary Patterns)that are descriptors on the two proposed hybrid and the five common color spaces. Then the extracted features can be evaluated by enhanced EFM, a Fisher Linear Discriminant.

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