Chapter 6

A Survey on Prematurity Detection of Diabetic Retinopathy Based on Fundus Images Using Deep Learning Techniques

Amiya Kumar Dash
KIIT University, India

Puspanjali Mohapatra
International Institute of Information Technology, Bhubaneswar, India

ABSTRACT

Diabetic retinopathy (DR) is a disease related to eye correlated with long-standing diabetes. It is a leading cause of blindness among working adults. Detection of this condition in the early stage is critical for good prognosis. Present day detection of DR normally requires digital fundus image or images generated using optical coherence tomography (OCT). As OCT are high-priced, diagnosis of DR using fundus image will benefit for the patient and the ophthalmologists. Manual inspection of morphological changes in blood vessels, microaneurysms, exudates, hemorrhages, and macula are time consuming and tedious tasks. So, designing a computer-aided system helps in analyzing the morphological changes and identifying the DR. This chapter reviews the applications of machine learning and deep learning algorithms for detection of nonproliferative diabetic retinopathy by analyzing fundus images.

INTRODUCTION

Medical image analysis is an active area of research in present days which attracts scientists and physicians from different domain. This area entails the examination of digital images to provide computational tools as a way to help the quantification and visualization of interesting pathology and anatomical structures. This field has brought off significant improvement over past few years. Physicians have advanced diagnostic tools to evaluate their patients in order to plan different forms of management and monitor the progress more efficiently than before.

Diabetic is a very common diseases Now-a-days. It is identified as a widespread epidemic that has progressive effect on every country across the globe irrespective of any age group. A survey was conducted by 'International Diabetes Federation', where they have generated a report showing that approximately 415 million people were suffering from diabetes worldwide and this number has increased in the past 30 years, especially in Asia. Of them, around one-thirds are diagnosed with diabetic retinopathy (DR), a chronic disease which can cause impaired vision and also complete vision loss in many cases. *Diabetic Retinopathy***(DR***)* is a major source of visual impairment among grown-ups and the older segment of the populace. It is connected with type 1 and type 2 diabetes. The reason for this is increase in glucose levels in veins in the retinal region, leading little spillages of blood, blood proteins, serum and blood fats. Detection of DR in the early stage prevents its progress.

Diagnosis of DR based on the examination of retinal images. Clinically, DR is categorized into different types. (1) ***Non-proliferative Diabetic Retinopathy (NPDR)**** is the first stage of this taxonomy. At this phase, fats and other deposits create microaneurysms which are spots on the walls of veins in the retina. At the point when the smaller scale aneurysms outpouch and spill, there is inflammation in the macula and in the nerve fibers. Blood Vessels might be obtruded and macula stops to work appropriately because of absence of oxygen, and obscuring the vision of the patient all the while. (2) ***Proliferative Diabetic Retinopathy (PDR)*** is the second phase. This happens when many blood vessels close and afterward the retina attempts to **make restitution** that by producing fresh blood vessels. This procedure is called neovascularization. However, these unusual vessels don't supply the proper quantity of blood to the retina. Another conceivable outcome is a harm to the optic nerve bringing about glaucoma. Figure 1 shows the images of NPDR and PDR (Li et al.,2014) with different levels.

There are many ways to get the imaging and hence diagnosis of Diabetic Retinopathy. In the recent past, a fluorescein test during angiography was the most common method of imaging the eye. In this method a fluorescein is visible in the arteries, which is absorbed in the tissue and lastly go back through the veins. A video clip is generated for the entire procedure as output. Diabetic Retinopathy

14 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/a-survey-on-prematurity-detection-of-diabetic-retinopathy-based-on-fundus-images-using-deep-learning-techniques/260117

Related Content

Malware and Anomaly Detection Using Machine Learning and Deep Learning Methods

Valliammal Narayanand Barani Shaju (2022). *Research Anthology on Machine Learning Techniques, Methods, and Applications (pp. 149-176).*

www.irma-international.org/chapter/malware-and-anomaly-detection-using-machine-learning-and-deep-learning-methods/307451

Credit Rating Forecasting Using Machine Learning Techniques

Mark Wallis, Kuldeep Kumarand Adrian Gepp (2022). *Research Anthology on Machine Learning Techniques, Methods, and Applications (pp. 734-752).*

www.irma-international.org/chapter/credit-rating-forecasting-using-machine-learning-techniques/307481

Development of a Charge Estimator for Piezoelectric Actuators: A Radial Basis Function Approach

Morteza Mohammadzaheri, Mohammadreza Emadi, Mojtaba Ghodsi, Issam M. Bahadur, Musaab Zarogand Ashraf Saleem (2020). *International Journal of Artificial Intelligence and Machine Learning (pp. 31-44).*

www.irma-international.org/article/development-of-a-charge-estimator-for-piezoelectric-actuators/249251

Optimum Design of Carbon Fiber-Reinforced Polymer (CFRP) Beams for Shear Capacity via Machine Learning Methods: Optimum Prediction Methods on Advance Ensemble Algorithms – Bagging Combinations

Melda Yucel, Aylin Ece Kayabekir, Sinan Melih Nigdeliand Gebrail Bekda (2022). *Research Anthology on Machine Learning Techniques, Methods, and Applications (pp. 308-326).*

www.irma-international.org/chapter/optimum-design-of-carbon-fiber-reinforced-polymer-cfrp-beams-for-shear-capacity-via-machine-learning-methods/307459

Pandemic Management Using Artificial Intelligence-Based Safety Measures:
Prediction and Prevention

Megha Nain, Shilpa Sharmaand Sandeep Chaurasia (2021). *Machine Learning and Data Analytics for Predicting, Managing, and Monitoring Disease (pp. 86-110).*

www.irma-international.org/chapter/pandemic-management-using-artificial-intelligence-based-safety-measures/286245