


Chapter 73

An Artificial Intelligence– Based Smart System for Early Glaucoma Recognition Using OCT Images

Law Kumar Singh

 <https://orcid.org/0000-0002-7073-6852>

Department of Computer Science and Engineering, School of Engineering and Technology, Sharda University, Knowledge Park III, Greater Noida, India & Department of Computer Science and Engineering, Hindustan College of Science and Technology, Mathura, India

Pooja

Department of Computer Science and Engineering, School of Engineering and Technology, Sharda University, Knowledge Park III, Greater Noida, India

Hitendra Garg

Department of Computer Engineering and Applications, GLA University, Mathura, India

Munish Khanna

Department of Computer Science and Engineering, Hindustan College of Science and Technology, Mathura, India

ABSTRACT

Glaucoma is a progressive and constant eye disease that leads to a deficiency of peripheral vision and, at last, leads to irrevocable loss of vision. Detection and identification of glaucoma are essential for earlier treatment and to reduce vision loss. This motivates us to present a study on intelligent diagnosis system based on machine learning algorithm(s) for glaucoma identification using three-dimensional optical coherence tomography (OCT) data. This experimental work is attempted on 70 glaucomatous and 70 healthy eyes from combination of public (Mendeley) dataset and private dataset. Forty-five vital features were extracted using two approaches from the OCT images. K-nearest neighbor (KNN), linear

DOI: 10.4018/978-1-6684-7544-7.ch073

Copyright © 2023, IGI Global. Copying or distributing in print or electronic forms without written permission of IGI Global is prohibited.

This chapter published as an Open Access Chapter distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0/>) which permits unrestricted use, distribution, and production in any medium, provided the author of the original work and original publication source are properly credited.

An Artificial Intelligence-Based Smart System for Early Glaucoma Recognition Using OCT Images

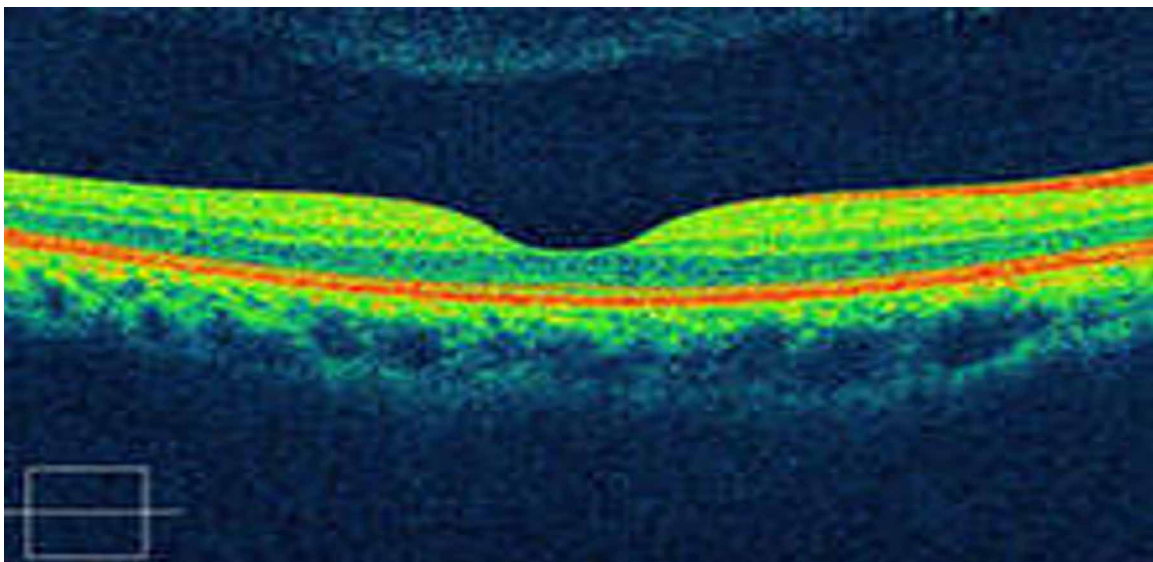
discriminant analysis (LDA), decision tree, random forest, support vector machine (SVM) were applied for the categorization of OCT images among the glaucomatous and non-glaucomatous class. The largest AUC is achieved by KNN (0.97). The accuracy is obtained on fivefold cross-validation techniques. This study will facilitate to reach high standards in glaucoma diagnosis.

1. INTRODUCTION

Glaucoma is the second most crucial optic ‘eye’ disease in this world. As per sources in 2010, approximately 60 million populations cross-sectional to be disease infected, and this count is increasing above 20 million in the period 2020. It does no repairable damage to the central part of the optic nerves that can lead to making the person blind. Hence, sensing Glaucoma during the initial stage is very imperative. Generally, doctors focus on the area of the optic disc & optic cup and find the edges through optic nerve examination. They assure the glaucoma presence they identify the increased size of the optic cup. One of the essential features is to identify the ratio of the height of the Cup to the disc; this is the crucial indicator for identifying Glaucoma. Among the patients, if the Cup-to-Disc ratio (CDR) value is at least 0.5, it may be considered as the glaucomatous eye.

Human eye mainly has three layers. The outer layer: Sclera, which is used to protect the eyeball; Second layer: Choroid and the innermost layer: Retina. “Retina” is liable in vision because of the presence of photoreceptors. Researchers have invented many techniques which are used for detecting retinal disorder. These techniques include fundus photography, fluorescein angiography, and the OCT.

Figure 1. OCT image with macular edema



29 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/an-artificial-intelligence-based-smart-system-for-early-glaucoma-recognition-using-oct-images/315111

Related Content

An Approach of SIFT With Fed-VGG16 and Fed-CNN for Identification and Classification of Brain Tumors

Shreeharsha Dashand Subhalaxmi Das (2024). *Enhancing Medical Imaging with Emerging Technologies* (pp. 70-85).

www.irma-international.org/chapter/an-approach-of-sift-with-fed-vgg16-and-fed-cnn-for-identification-and-classification-of-brain-tumors/344663

Implementation and Performance Assessment of Biomedical Image Compression and Reconstruction Algorithms for Telemedicine Applications: Compressive Sensing for Biomedical Images

Charu Bhardwaj, Urvashi Sharma, Shruti Jainand Meenakshi Sood (2023). *Research Anthology on Improving Medical Imaging Techniques for Analysis and Intervention* (pp. 1571-1598).

www.irma-international.org/chapter/implementation-and-performance-assessment-of-biomedical-image-compression-and-reconstruction-algorithms-for-telemedicine-applications/315119

Detection and Classification of Leukocytes in Blood Smear Images: State of the Art and Challenges

Renuka Veerappa Tali, Surekha Borraand Mufti Mahmud (2023). *Research Anthology on Improving Medical Imaging Techniques for Analysis and Intervention* (pp. 1099-1130).

www.irma-international.org/chapter/detection-and-classification-of-leukocytes-in-blood-smear-images/315094

Noise Removal in Lung LDCT Images by Novel Discrete Wavelet-Based Denoising With Adaptive Thresholding Technique

Shabana R. Ziyad, Radha V.and Thavavel Vaiyapuri (2023). *Research Anthology on Improving Medical Imaging Techniques for Analysis and Intervention* (pp. 706-721).

www.irma-international.org/chapter/noise-removal-in-lung-ldct-images-by-novel-discrete-wavelet-based-denoising-with-adaptive-thresholding-technique/315071

A Software for Thorax Images Analysis Based on Deep Learning

Ahmed H. Almulihi, Fahd S. Alharithi, Seifeddine Mechti, Roobaea Alroobaeaand Saeed Rubaiee (2023). *Research Anthology on Improving Medical Imaging Techniques for Analysis and Intervention* (pp. 1166-1178).

www.irma-international.org/chapter/a-software-for-thorax-images-analysis-based-on-deep-learning/315097