

Acta Ophthalmologica

Abstracts from the 2021 European Association for Vision and Eye Research Festival | [Free Access](#)

Evaluating the diagnostic generalizability of deep learning models trained with images of the ganglion cell layer of early glaucoma

Valentín Tinguaro Díaz-Alemán, Silvia Alayón Miranda, Francisco José Fumero Batista, Sandra Gómez Perera, Rafael Arnay del Arco, José Francisco Sigut Saavedra

First published: 03 January 2022 | <https://doi.org/10.1111/j.1755-3768.2022.096>

Abstract

Purpose

To determine the diagnostic generalizability of two deep learning models when trained only with images of the ganglion cell layer (GCL) of mild glaucoma.

Methods

We have collected a sample from patients with primary and secondary open-angle glaucoma and normal patients. The sample was divided into mild glaucoma ($MD \leq 6$ dB), and moderate-advanced ($MD > 6$ dB). The GCL images were recorded with a spectral-domain Optical Coherence Tomography. Two pre-trained models were used, the ResNet101 and the Shufflenet. The sensitivity, specificity, diagnostic precision in training and test, and the ROC area were calculated for the two models with three different training conditions according to how the images were partitioned into training and test. In the first partition, mild glaucomas were used for training and moderate-advanced for test. In the second, moderate-advanced glaucomas were used for training and mild for test. In the third, the whole sample was used without classifying by severity. Gradient-weighted Class Activation Mapping (GradCAM) was used to obtain saliency maps which highlight the more important components in the images for the model prediction. The correlation coefficient between the maps of the glaucoma and normal images of the two models was calculated.

Results

561 eyes were collected from 337 patients, 356 are glaucomatous and 200 are normal. The precision of the models in the test set in partition 1, was 90.9% (ResNet101) and 94.2% (Shufflenet). In partition 2, was 74.4% (ResNet101) and 73.5% (Shufflenet), and in partition 3 an accuracy of 94.6% was found with both models. The correlation coefficient between the GradCAM saliency maps of the models was 0.46 for glaucoma images and 0.83 for normal images.

Conclusions

The two deep learning models are able to generalize and have high diagnostic precision if they are trained only with images of the GCL of mild glaucoma. Both models show high correlation in the GradCAM saliency maps with normal images.



Volume 100, Issue S267
Special Issue: Abstracts
from the 2021 European
Association for Vision and
Eye Research Festival
January 2022



Related



Information

Recommended

Mitomycin C-augmented deep sclerectomy in primary open-angle glaucoma and exfoliation glaucoma: a three-year prospective study

Minna L. Ollikainen, Tuomo J. Puustjärvi, Petri K. Rekonen, Hannu M. Uusitalo, Markku E. Teräsvirta

Acta Ophthalmologica

Deep sclerectomy for the treatment of exfoliation and primary open-angle glaucoma

Petri Rekonen, Tapio Kannisto, Tuomo Puustjärvi, Markku Teräsvirta, Hannu Uusitalo

Acta Ophthalmologica Scandinavica

Elementerätzel: Das soeben eingeschulte Element

Nachrichten aus der Chemie

[← Back](#)

[Accessibility](#)

[Wiley Research DE&I Statement
and Publishing Policies](#)

[Developing World Access](#)

WILEY

Copyright © 1999-2023 John Wiley & Sons, Inc. All rights reserved