

Image quality assessment of ultra-widefield fundus images using deep convolutional neural networks

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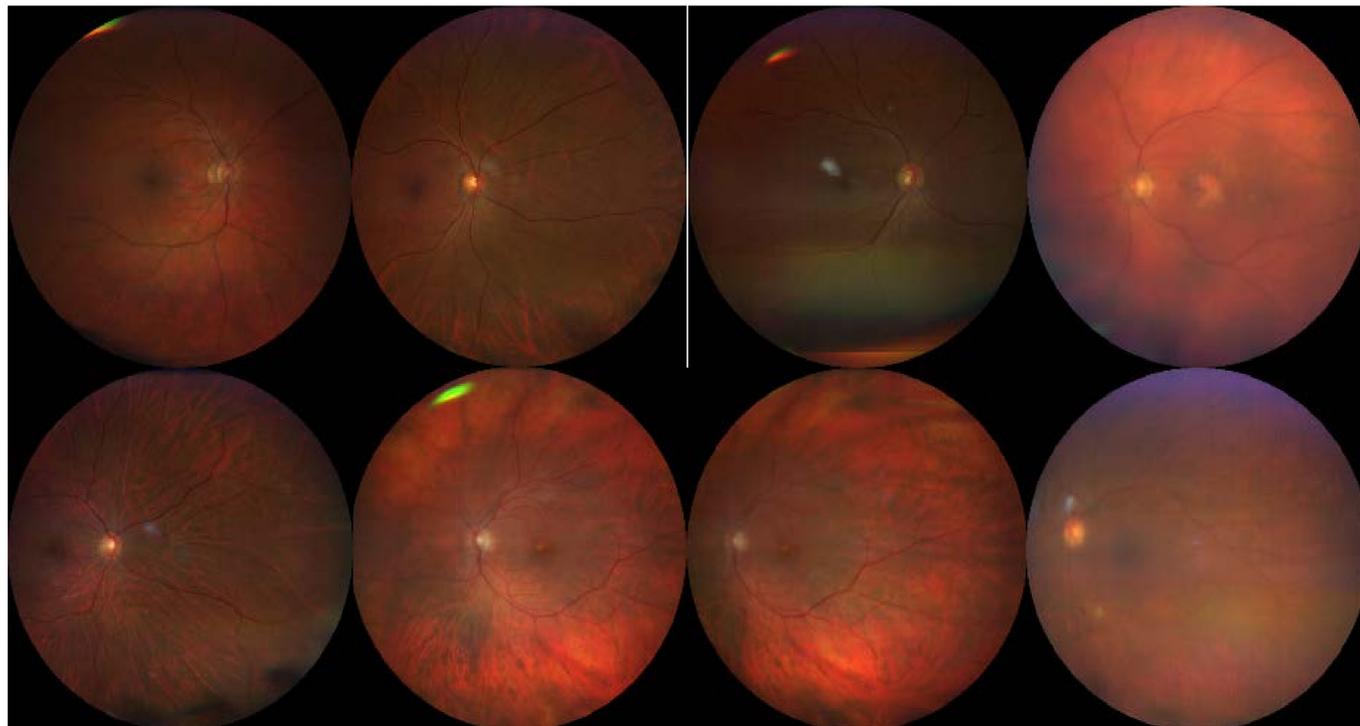
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PURPOSE

- Insufficient image quality of fundus images limits manual or automatic image grading processes, resulting in a loss of data for that particular visit.
- Automated evaluation of image quality would help the operator by giving them quick feedback to reacquire the images when the quality is inadequate.
- We propose a deep neural network based approach that predicts the quality of a high resolution fundus image immediately after acquisition time .

METHODS

- A deep Residual Network (ResNet) using TensorFlow was trained.
- 561 Good and 74 Bad images taken with CLARUS™ 500 (Zeiss, Dublin, CA)
- Used data augmentation at training time by applying random flips to the images.
- Example of some bad quality images : severe blurring, reflex, vignetting, striping, or rainbow discoloration
- To speed up training and inference time, we downscaled the high-resolution images and cropped each image to 224 x 224 pixel each.

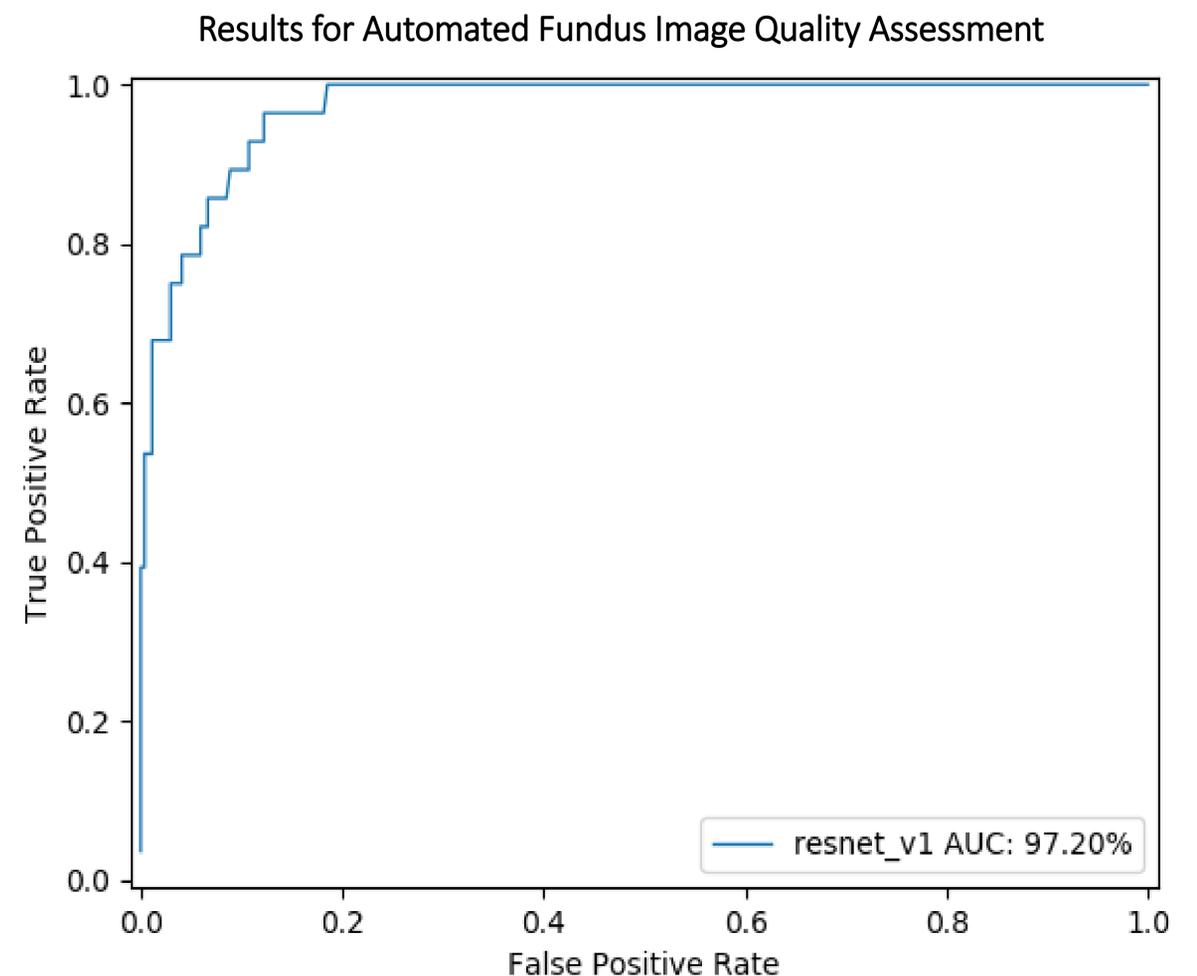


(a) Good Images

(b) Bad Images

RESULTS

- The test set had a total of 298 images out of which 270 were of good quality and 28 were of inadequate quality. The percentage of bad quality images is greater than the average occurrence of bad quality to maintain balance in training.
- The algorithm achieves an Area under the Curve (AUC) of 97.20%. Out of the 9 misclassified images, 66% of them are bad quality images which are classified as good quality images.



CONCLUSIONS

- A solution for automated image quality assessment of fundus images taken by CLARUS 500 has been presented.
- The presented deep learning algorithm achieves a very promising result even with a handful of data.
- Thus, it enables the operator to obtain feedback on image quality at acquisition time and to reacquire images when the quality is poor.