

# End-to-End Mobile System for Diabetic Retinopathy Screening Based on Lightweight Deep Neural Network

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**Abstract.** Diabetic Retinopathy (DR) is the leading cause of visual impairment among working-aged adults. Screening and early diagnosis of DR is essential to avoid visual acuity reduction and blindness. However, a worldwide limited access to ophthalmologists may prevent an early diagnosis of this blinding condition. In this paper, we propose a novel method for screening DR from smartphone-captured fundus images. The main challenges are to perform higher accurate detection even with reduced quality of handheld captured fundus images and to provide the result into the smartphone used for acquisition. For such a need, we apply transfer learning to the lightweight deep neural network “NasnetMobile” which is used as a feature descriptor, while configuring a multi-layer perceptron classifier to deduce the DR disease, in order to take benefit from their lower complexity. A dataset composed of 440 fundus images is structured, where the acquisition and statement are performed by expert ophthalmologists. A cross-validation process is conducted where 95.91% accuracy, 94.44% sensitivity, 96.92% specificity and 95.71% precision in average are achieved. In addition, the whole processing flowchart is implemented into a mobile device, where the execution time is under one second whatever the fundus image is. Those performances allow deploying the proposed system in a clinical context.

**Keywords:** Diabetic retinopathy, Deep learning, Transfer Learning, Mobile-health.