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The use of a teachable machine in the detection of diabetic retinopathy from fundus examination databases and its application as a population screening method

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INTRODUCTION: Diabetic retinopathy (DR) is one of the leading causes of preventable blindness, and early diagnosis is essential to reduce visual loss. Limited access to ophthalmologic screening in public health systems remains a significant barrier. Artificial intelligence (AI)–based analysis of fundus images has emerged as an alternative to expand screening capacity. **OBJECTIVE**: To evaluate the performance of a machine learning model for automated detection and classification of DR using fundus images. **METHODS**: Fundus images from a publicly available dataset were used to train and test a machine learning model, classified into five categories (R0–R4). Performance was assessed using sensitivity, specificity, accuracy, predictive values, and likelihood ratios. **RESULTS**: Performance varied according to severity. In R1, the model showed Se 65%, Sp 87.5%, Acc 83%, PPV 56.5%, NPV 90.9%, and LR+ 5.2. In R2, Se 55%, Sp 52.5%, Acc 53%, PPV 22.4%, NPV 82.4%, and LR+ 1.16. In R3, Se 30%, Sp 95%, Acc 82%, PPV 60%, NPV 84.4%, and LR+ 5.9. In R4, Se 40%, Sp 98.8%, Acc 87%, PPV 88.9%, NPV 86.8%, and LR+ 32.0. In the overall diagnosis of DR, the model showed Se 92.5%, Sp 15%, Acc 77%, PPV 81.3%, NPV 33.3%, and LR+ 1.09. **DISCUSSION**: DR ranges from non-proliferative to proliferative forms, with macular edema possible at any stage. Its pathophysiology involves early microvascular damage progressing to ischemia and neovascularization, often asymptomatic, reinforcing the importance of screening. The model demonstrated heterogeneous accuracy, with moderate performance in early stages, limited reliability in intermediate stages, and high specificity in advanced disease. Positive predictive values were high in severe stages, indicating good reliability for confirming diagnosis. Additionally, the relatively high negative predictive value in the absence-of-disease scenario suggests good ability to exclude DR, supporting its use as a screening tool. However, low overall specificity and limitations in early-stage differentiation highlight the need for further refinement. **CONCLUSION**: The model showed potential for detecting DR, proving to be a useful tool for disease screening, with further refinements still possible to optimize its use.

KEYWORDS: Diabetic retinopathy; Artificial intelligence; Machine learning.

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