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Diabetic Retinopathy Detection and Grading Using ImageNet-Based Transfer Learning on Fundus Images

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Abstract: *Automated detection and grading of diabetic retinopathy from retinal fundus images has grown quickly with the use of convolutional neural networks, especially models adapted through transfer learning from ImageNet. This review outlines how ImageNet-based CNNs have evolved for DR screening, the datasets and preprocessing steps typically used, the major architectures and fine-tuning approaches, and the metrics researchers rely on to measure performance. It also highlights work on clinical validation, along with ongoing challenges such as inconsistent image quality, variation in expert annotations, domain shift across devices and populations, and limited model interpretability. The review closes with emerging directions, including federated learning, multimodal systems, stronger explainability tools, and deployment-focused design. Key studies and benchmark results are included to help researchers develop reliable DR screening systems suitable for clinical use.*

Keywords: Diabetic retinopathy, fundus imaging, convolutional neural networks, transfer learning, ImageNet, EyePACS, Messidor, grading, screening.

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