Title: SwAV-driven diagnostics: new perspectives on grading diabetic retinopathy from retinal photography

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Abstract: Diabetic Retinopathy (DR) is a progressive retinal condition that is considered the most prevalent and common consequence of diabetes mellitus Nathan (1993). A comprehensive review by Teo et al. (2021) highlighted that DR stands as a leading contributor to avoidable vision impairment among the worldwide working-age population. The study also reported that in 2020, the global prevalence of this illness topped 103.12 million. According to predictions by that study, the total will rise to around 160.50 million by 2045. In persons aged 50 and older, DR was the seventh largest reason for blindness and moderate to severe visual impairment. It is a slowly developing hidden chronic disease that often occurs in people with diabetes. DR does not show clear early signs; as it worsens, complete blindness is the likely outcome.Regular screening helps catch DR early, preventing further damage with the right medication. High-resolution fundus images are used to spot tiny lesions and assess their severity. DR comes in two main forms: Proliferative DR (PDR) and Non-proliferative DR (NPDR). NPDR comprises four levels of severity—severity level 0 to 3 (Fong et al., 2004). Figure 1 displays typical DR symptoms. A microaneurysm (MA) manifests as a small, dark red dot-like lesion observed at the terminal of a blood vessel (Manjiri et al., 2015). Hypertension and blockage of the retinal veins have the potential to result in retinal hemorrhage (HM), which is another complication associated with DR (Kanukollu and Ahmad, 2023). Occasionally, small retinal hemorrhages (HM) may bear resemblance to microaneurysms (MA) (Soriano and Aguirre, 2016). Exudates, which include lipids and protein residues, filter out wounded capillaries. In its latter stages, DR is difficult to treat. The Mild NPDR shows only a few microaneurysms. In contrast, moderate NPDR patients experience many MAs, hemorrhages, and venous beading, which compromises their ability to move blood to the retina. Severe DR is characterized by above 20 intraretinal hemorrhages per quadrant, at least two quadrants with noticeable venous beading, and significant intraretinal microvascular abnormalities (IRMA) in at least one quadrant. During the PDR stage, new blood vessels (neovascularization) emerge with vitreous or pre-retinal hemorrhages (Shukla and Tripathy, 2023). Fundus imaging is utilized for the diagnosis of DR. Ophthalmologists evaluate fundus images for visible lesions, assess a DR level, and recommend suitable treatment options.

Keywords: Diabetic retinopathy (DR) Proliferative DR (PDR) Non-proliferative DR (NPDR) Microaneurysms (MA) Retinal hemorrhage (HM)

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