Chapter 6
A Hybrid ArtInt Model to Predict Diabetic Retinopathy

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ABSTRACT

Diabetic retinopathy (DR) is retinal blood vessel damage caused by diabetes (DED). Untreated, the condition can cause blindness. Early visual impairment can be averted by monitoring and treating diabetes. Many scientists have developed machine learning techniques to detect DR earlier. Model results proved their usefulness. A WHO research predicts that 40–45% of the world's 347 million diabetics have DR. Early DR diagnosis and therapy can substantially slow visual loss. Current DR detection approaches entail skilled doctors manually analysing digital fundus images, which can cause miscommunication and postpone therapy. This study grades DR intensity as mild, moderate, or severe. A new AI model uses support vector machines and Vgg-16 to classify DR. The results suggest that integrating both models yields better outcomes than standard models.

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1. INTRODUCTION

Diabetes risk and loss of sight are both directly linked to Diabetic Retinopathy (DR). The retina is the back of the eye's protective tissue. The sensitivity to light here is extraordinary. It converts all incoming light into signals that the brain can infer. These sensory impressions allow the eye to function. DR causes fluid leakage and permanent vision loss by damaging blood vessels in the retina. Non-proliferative DR (nPDR) and proliferative DR (pDR) are the two main categories of DR. Nasopharyngeal carcinoma represents an asymptomatic or mildly symptomatic form of the disease. The retinal blood vessels get weakened and leads to the formation of nPDR. Macula Edoema can be caused by fluid leakage into the retinal blood vessels from micro aneurysms. pDR can occur when blood sugar levels fluctuate frequently over time. This condition is called proliferative DR because new blood vessels sprout from the retina's surface. When these blood vessels harden, fluid or blood can leak out of them. The end result is permanent vision loss due to retinal damage. The development of new blood vessels causes scar tissue that can eventually cause the retina to isolate from the back of the eye. The pressure inside the eye can rise due to the leakage of the liquid from an affected eye. Glaucoma can develop if the processes described above create injury to the nerves that transmit visual information. Symptoms of DR are uncommon in the earliest stages. When symptoms manifest, the disease is usually well along in its progression. Most of the time, sudden and complete blindness is the only symptom present. The major indications of DR comprise of blurred vision, appearance of floaters like colourless spots, dark threads, the blocking of the patient's vision by blotches or smudges, meagre night vision and quick loss of vision. Figure 1 indicates the difference in blood vessels of normal eye and DR affected eye.

Figure 1. Difference Between a Normal Eye and an Eye with Retinopathy
Source: Understanding the Stages of Diabetic Retinopathy | Elman Retina Group