

**AN OPTIMIZED CONVOLUTIONAL NEURAL NETWORK-BASED
ENSEMBLE CLASSIFICATION AND REGRESSION
FRAMEWORK FOR CLASSIFYING THE STAGES
OF DIABETIC RETINOPATHY**

By

Valarmathi S

(Reg. No.: 19PHCSF006)

Supervisor

Dr. (Mrs). R. Vijayabhanu

Assistant Professor (SG), Department of Computer Science

A Thesis submitted to the

Avinashilingam Institute for Home Science and Higher Education

for Women, Coimbatore – 641043

In partial fulfilment of the requirements for the Degree of

Doctor of Philosophy in Computer Science

MAY 2024

80_RECOMMENDATION

The proposed methods are designed to improve the classification performance of Diabetic Retinopathy (DR) stages. While the models perform well in the current system setting, they require high computational resources, limiting accessibility to those with access to high-performance computing. Therefore, future enhancements are necessary to handle large volumes of data and computational resource demands. However, the primary objective of this research has been successfully achieved by improving DR stage classification performance using an optimized convolutional neural network-based ensemble classification and regression framework, with a focus on aiding ophthalmologists in decision-making.

- The proposed deep learning models can be implemented on cloud-based platforms.
- The model can be generalized to classify other diabetic eye diseases, such as Glaucoma, Macular Edema, Cataracts, and more.
- Hybrid optimization algorithms can be considered for tuning CNN hyperparameters.
- Various combinations of neural network architectures, such as transformers, CNNs, and recurrent neural networks (RNNs), can be explored to leverage their respective strengths.
- Advanced strategies can be proposed to create smaller, more efficient models for edge devices and low-resource environments.
- Domain-specific pre-trained models can be developed to accelerate the creation of medical applications.