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A HYBRID MOBILENETV2–SNAKE OPTIMISER FRAMEWORK FOR AUTOMATED RETINAL DISEASE RECOGNITION USING FUNDUS PHOTOGRAPHY

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ABSTRACT

Purpose: This study aims to develop an intelligent framework that automatically identifies major retinal diseases from fundus images and improves diagnostic performance by optimising deep learning hyperparameters.

Design/Methodology/Approach: A deep learning framework was developed using transfer learning and evaluated on retinal fundus images across four categories: cataract, glaucoma, diabetic retinopathy, and normal. Three pretrained convolutional neural network architectures, namely MobileNetV2, VGG16, and InceptionV3, were investigated and compared. Image preprocessing procedures were applied before training, including resizing, normalisation, and label encoding. To further enhance performance, the Snake Optimiser was employed to search for the most suitable hyperparameter settings of the best-performing network. Model effectiveness was assessed using accuracy, precision, recall, and F1-score.

Research Limitation: The proposed framework was validated using a single retinal image dataset containing four disease categories. The study did not include external clinical validation or multimodal ophthalmic data, which may further improve generalizability and diagnostic reliability in real-world healthcare environments.

Findings: The comparative analysis showed that MobileNetV2 achieved superior performance among the evaluated architectures before optimisation. After integrating the Snake Optimiser, the classification performance improved substantially, reaching an overall accuracy of 96.33%. The optimised model demonstrated excellent capability in distinguishing retinal disease

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