N° d'ordre ……..année……

جامعة عبد المالك السعدي
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Université Abdelmalek Essaadi

Pôle des Etudes Doctorales
Centre des Etudes Doctorales Sciences et Techniques et Sciences Médicales

AVIS DE SOUTENANCE DE THESE DE DOCTORAT

Monsieur HIRI Mustafa
Présentera ses travaux de recherche en vue de l'obtention du Doctorat

Formation Doctorale : Sciences Mathématiques, Physiques et Nouvelles Technologies
Discipline : Informatique
Spécialité : Intelligence Artificielle

Le 24/04/2026 à 16H00 à la Salle des Soutenances de la Faculté des Sciences de Tétouan, UAE

Sous le thème

Optimisation de la Classification de la Rétinopathie Diabétique par l'Intégration de Noyaux Adaptatifs dans les Réseaux Neuronaux Profonds VGG16

Devant le jury composé de :

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Résumé

Diabetic Retinopathy (DR) is a leading cause of vision impairment, primarily driven by diabetes and aging-related issues. The increasing number of diabetic individuals worldwide indicates that DR will continue to be a major factor in vision loss, significantly affecting the quality of life for many patients. Early detection and prompt treatment are crucial in preventing severe optical problems and reducing the risk of blindness.

Traditional diagnostic methods often face limitations in consistency and accuracy. Leveraging the power of deep learning, particularly Convolutional Neural Networks (CNNs), has shown promise in medical image analysis. This thesis introduces an innovative approach to enhance the classification of DR stages by augmenting the Visual Geometry Group 16 (VGG16) architecture with adaptive kernel techniques. Unlike the conventional VGG16 model, which uses fixed kernel sizes, this research integrates multiple convolutional branches with varying kernel sizes (3x3, 5x5, and 7x7) after the 'block5_conv1' layer.

These branches are adaptively merged using a softmax-weighted combination, allowing the model to prioritize kernel sizes based on intricate image features.
To address the challenge of imbalanced datasets, the Synthetic Minority Over-sampling Technique (SMOTE) was applied before training, ensuring balanced representation across the five DR stages. The proposed model, which fine-tunes a pre-trained VGG16, demonstrates the ability to detect patterns for DR with improved accuracy and sensitivity.

The experimental results show that the model effectively extracts features, leading to high classification accuracy.Compared to other CNN models, this approach shows a promising enhancement in the early detection of diabetic diseases. This advancement aids ophthalmologists in biomedical technologies, providing a valuable diagnostic tool for DR detection and management.

The integration of adaptive kernels in deep learning frameworks represents a significant advancement in medical imaging classification tasks, showcasing the potential of this approach to revolutionize the early diagnosis of DR, ultimately aiding in the preservation of vision for millions at risk.

Keywords : Diabetic Retinopathy; VGG16; Adaptive Kernels; Deep Learning; Image Classification; SMOTE; Convolutional Neural Networks; Medical Imaging; Softmax-weighted Fusion; Transfer Learning; Data Augmentation; Retinal Image Analysis; Artificial Intelligence in Healthcare; Ophthalmology; Computer-aided Diagnosis