National Institute of Technology Rourkela

Defence Seminar

Seminar Title	: Deep Learning Techniques for Automated Assessment of Diabetic Retinopathy Grading
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Venue	: Seminar Room (EC 303), Department of Electronics and Communication Engineering, NIT Rourkela
Date and Time	: 28 Jul 2025 (4:00 p.m.)
Abstract	:

Diabetic retinopathy (DR) is a condition often associated with diabetes, resulting from elevated blood glucose levels that cause retinal damage. DR grading is complicated because it requires recognizing interclass variation, handling skewed data distributions, and detecting microaneurysms. Convolutional neural networks (CNN) often encounter challenges in identifying and detecting minor lesions due to their channel-specific nature and lack of spatial awareness, complicating the grading process. The thesis work proposes several ways to address the challenges mentioned above. The techniques include i) A multi-resolution convolutional attention network (MuR-CAN), which employs varying dilation rates to facilitate the extraction of multi-scale features with an increased field of view. ii) A synergistic channel-spatial and self-attention technique is introduced to capture long-range dependencies and reduce trainable parameters. iii) A dual-feature co-attentive fusion network (DFCAFNet) network is proposed to capture, the correlation between the features of two complementary networks. iv) To overcome the limitation of spatial confinement of conventional CNN, a densely connected cascaded dense block with a two-fold cross-feature enhancement module is proposed to emphasize the cross-channel and cross-spatial information present in the feature maps. v) To overcome the spatial-agnostic and channel-specific nature of conventional CNNs, a dynamic weighted adaptive kernel convolution (DWAKC) is proposed. The proposed methodologies are assessed using three publicly available datasets: DDR, EyePACS, and APTOS-2019.