**Optimized CNN Approach for Efficient Image Classification**

**Introduction**

Image classification is a crucial application of computer vision, widely used in healthcare, security, and autonomous systems. Convolutional Neural Networks (CNNs) have achieved remarkable success in this field, but their high computational cost limits deployment in real-time and resource-constrained environments. Optimizing CNN architectures is essential to improve efficiency without sacrificing accuracy.

This study explores optimization techniques such as depthwise separable convolutions to reduce computational complexity, batch normalization for stable training, and dropout to prevent overfitting. Additionally, a dynamic learning rate scheduler and early stopping mechanism are implemented to enhance training efficiency. Data augmentation is also employed to improve model generalization across diverse datasets.

Using Python-based deep learning frameworks like TensorFlow and PyTorch, our optimized CNN achieves competitive accuracy with lower computational requirements. This research contributes to developing lightweight yet high-performance image classification models suitable for real-world applications, including edge computing and mobile devices.